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Physician and Surgeon

1988



Johannes Harris. D. D.
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Lexicon Technicum :

Or, An UNIVERSAL

English Dictionary

O F

ARTS and SCIENCES:

Explaining not only the TERMS of ART,
but the ARTS Themselves.

V O L. I

By *JOHN HARRIS*, D.D. and F.R.S.

The Third Edition.

L O N D O N :

Printed for Dan. Browne, Tim. Goodwin, John Walthoe,
John Nicholson, Ben. Tooke, Dan. Midwinter, and
Tho. Ward. *MDCCXVI.*

Lexicon Technicum :

OR ARTS AND SCIENCES.

English Dictionary

OF

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but the ARTS themselves.

VOL. I.

By JOHN HARRIS, D.D. and F.R.S.

The Third Edition.

LONDON:

Printed for Dan Brown, Tins Contractor, John Wallcut,
John Nicholson, Book-Binders, and
The Author, MDCCLXXI.

T O

His Royal Highness.

GREAT SIR,

I Justly esteem it a Peculiar Happiness, that You were pleas'd to accept of the Patronage of this Work; for hereby you exempt me from that Hardship which attends most Dedicators, of inventing the Virtues they Celebrate.

But tho' your Intrinsic Excellence and Real Worth takes away all Possibility of Flattery, yet being convinced that whatever I can say, falls short of your Merit, I Blush as much at my Incapacity of giving You Your just Due, as I should at ascribing more than He deserved to another.

Your Early Years, GREAT SIR, shew'd Your Skill and Conduct in Arms, as well as the Greatness of Your Courage and Love for Glory; and 'twas an uncommon Happiness your Bravery was more than once blest with, by Your own Personal Valour to Save Your Royal Brother, Rout the Enemies Troops, and Change the Fate of the Battle.

After this, when Your Happy Alliance with Your Royal Consort, Our present Gracious and Most Excellent QUEEN, had made You Ours, tho' you were always ready to offer your Self to Command Our Armies or our Fleets, yet when we deny'd our Selves the Happiness of your Conquering for us Abroad, you set your Self to shew us an Illustrious Example of Virtue and Goodness at Home; and prov'd you Self to be as much above Pride and Revenge here, as you would have been without Fear or Surprize there.

The Epistle Dedicatory.

Great within Your Selves Alone, Your Royal Confort and Your Self, like the best of the Old Roman Generals and Consuls, liv'd Retired indeed, but neither unactively nor unusefully: Virtue and Piety You taught, by the best way of Recommending it, Your own Bright, Great, and Glorious Examples; And raised up the Conjugal Happiness to such a Degree of Perfection, as the World never knew before, and which could You have been Unbeloved, would have render'd you almost the Envy of every one.

Then, MIGHTY SIR, did You employ your Noble Mind in Studies of the greatest Use and Benefit to Mankind here, Mathematicks and Mechanicks; and as Your Closet was always the Resort of the usefully Learned and Ingenious, so were you still their Encourager and Patron.

But when the Providence of GOD called Your Illustrious Princess to Empire, and Your Self to Publick Business and Mighty Employments, You soon Both shew'd You could Command with as much Wisdom and Conduct, as you could before Obey with Resignation, and make our Nation Truly Happy by the Gracious and Excellent Administration of your Government.

The Glorious Effects of which that we may long Enjoy, and that Our Gracious QUEEN, and Your ROYAL HIGHNESS, may be Blessed with Issue to Inherit these Great Dominions, that I doubt not but GOD hath raised up HER SACRED MAJESTY to secure in lasting Peace and Happiness to us, is,

GREAT SIR,

The most Sincere and Constant Prayer

of Your ROYAL HIGHNESS'S

Most Obedient and Most Humble Servant

JOHN HARRIS.

THE P R E F A C E.

THE best Account I can give of the following Work, will be to lay before you in a short View what it contains, wherein it differs from other Books which may seem to be of the same Nature, and from whence I have collected the Substance of it. That which I have aimed at, is to make it a Dictionary, not only of bare *Words* but *Things*; and that the Reader may not only find here an Explication of the *Technical Words*, or the Terms of Art made use of in all the *Liberal Sciences*, and such as border nearly upon them, but also those *Arts themselves*; and especially *such*, and *such* Parts of them, as are most Useful and Advantageous to Mankind. In this, which was the chief of my Design, I found much less Help from Dictionaries already published, than one would have expected from their *Titles*: *Chauvin's Lexicon Rationale*, or *Thesaurus Philosophicus*, is a well printed Book, and the Figures are finely Graved; but 'tis too much filled with the School Terms, to be usefully instructive; and is as defective in the Modern Improvements of Mathematical and Physic Learning, as it abounds with a Cant which was once mistaken for *Science*.

The *Grand Dictionnaire Des Arts & Sciences*, par *Mrs. de l'Academie Francoise*, hath no Cuts nor Figures at all, and is only a bare Explication of Terms of Art; and it seems rather to have been design'd to improve and propagate the *French Language*, than to inform and instruct the Humane Mind in general. And, which I have often wonder'd at, 'tis filled every where with *Simple Terms*, so that you are told what a Dog, a Cat, a Horse and a Sheep is; which, tho' it may be useful to some Persons who did not know *that* before, and may shew very well, that such Descriptions can be given in *French*; yet how the bare Names of Animals and Vegetables, of Metals and Mineral, can be reckoned as *Terms of Art*, and consequently make the greatest part of a *Dictionary of Arts and Sciences*, I confess I cannot see: And therefore, tho' this and *Mr. Furetiere's Dictionary* may be Books very well done in their Way, and are certainly very useful for those who would be perfectly acquainted with the *French Tongue*; yet I did not find much Assistance from them, with regard to my Design.

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And much less Help was there to be had from a Book called, *The New World of Words, or an Universal English Dictionary*; for there I found the Compiler had the *Ill Luck* to Collect many *Foreign* Faults, and to understand little or nothing of the *Arts* and *Sciences* himself.

Mr. *Ozanam's Dictionaire Mathematique*, is indeed as good a Book as *Vitalis's* is a bad one; and had *Mathematicks* been a Science I was the least acquainted with of any other, I should have been generally as well supplied from *Ozanam*, as deceived by *Vitalis*; whose last Edition, in two Volumes at *Rome*, after so many Years time to consider upon the Matter, is, I think, not better than the First, because it hath more Matter, and less to the Purpose.

The *Chymical* and *Physical Dictionaries* of *Johnson, Castellus*, and *Blanchard*, have a great many Words and Terms that are not to be met with elsewhere: And the last hath had four Editions in our own Language; but tho' many things are well enough done in him, yet some can hardly be said to be so; so that in many Places I have been obliged to put his Name to what my *Amanuensis* or *Assistent* transcribed from him, lest the Reader shou'd mistake it for my own Words.

I write not this only to disparage the Performances of others, or to build my self a Reputation on their Ruins, but I think my self obliged to acquaint the Reader with the plain Truth of Things, without Favour or Affection, that so he may be informed where to meet with Satisfaction in his Enquiries and Reading, and where not; and perhaps if this were oftner done, both the Time and the Expence of gaining true Knowledge would be much shortned.

There are some other lesser Dictionaries which are of good use, and which have been serviceable to me on Occasion, which I shall mention below; but I must next acquaint the Reader, That *much the greater Part* of what he will find here is collected from *no Dictionaries*, but from the best Original Authors I could procure in all Arts and Sciences, and is the Result of some Years Labour and Consideration.

I have been very Full and Particular in the *Mathematicks*, because it is the only Solid Foundation on which a Useful Enquiry into Nature and all Physical Learning can possibly be built; and because 'tis also of the greatest Use and Advantage to Mankind in all Respects.

In *Geometry*, under the Name of each Figure you have the Essential Properties of it briefly and plainly demonstrated, and the Application to the Practice shewed; so that by the Help of very easy
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References from one Place to another, you will find the Demonstration of all such useful and important Propositions in that Noble Science, as are usually given by *Geometrick* Writers,

Under such Words as *Parabola*, *Ellipsis*, *Hyperbola*, &c. in the *Conick Sections* you will find the Properties of each Figure or *Section* demonstrated, with Methods for their Description on a Plane; as also the Properties of the *Cycloid*, *Conchoid*, *Logarithmick-Line*, *Ciffoid*, *Quadratrix* and *Spiral Lines*, &c. Some general Considerations of the Nature of *Asymptotes*, the Nature and Properties of *Catacaustick* and *Diacustick* Figures, of the *Involute* and *Evolute*, of the *Linea Celerrimi Descensus*, &c. And under the Word *Construction*, you have the Construction of *Cubick* and *Biquadratick Equations* by the *Parabola*; together with the Investigation of *Baker's Central Rule*, and its Use and Application.

Under such general Words as *Trigonometry*, *Surveying*, *Spherical Geometry*, *Projection*, &c. you will find Entire Treatises on these Heads; and which, if I mistake not, are as short and plain as any yet extant.

In *Algebra* you will meet, under the proper Heads, every thing that is usually found in Treatises of this Nature, and perhaps something more. And under *Fluxions* you have a succinct Account of the *Nature* and *Algorithm* of them, and some Improvements which are not to be had elsewhere. And in several Places under the proper Words, you have an Account of what we now call the *New Methods*, or *Universal Ways of Investigation*; as particularly, a Method of drawing of *Tangents* to all sorts of *Curves*, a Method *de Maximis & Minimis*, &c. of finding the *Centers of Gravity* and *Oscillation*; of finding the *Uncia*, &c. All the Parts also of *Common Arithmetick* are explained here, and its Application to *Anatocism*, *Compound Interest*, and *Annuities*; together with the Doctrine of *Surds*, the Method of Extraction of *Roots* by *Converging Series*, and the entire Doctrine of *Promotion*; all kinds of *Progression*, *Fractions*, *Logarithms* and *Decimals*: And I have also, from the best Authors I could get, collected an Account of the Ancient *Weights* and *Measures* of all Nations, and adjusted them with our own; and have given you very large and useful *Tables* of the *Values* of all *Modern* or *present Foreign Weights, Measures and Coins*, compared with our own. I have inserted also, from *Dr. Wallis*, a large Account of *Sexagesimal Fractions*. You will find here also the *Descriptions* and *Uses* of both the *Celestial* and *Terrestrial Globe*; the *Doctrine* of the *Sphere*, according to the *New* and *Old Hypothesis*; together with the *Demonstration* and *Practice* of *Spherick Projections in Plano*; and most of

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of the useful things in *Astronomy*, as the *Phænomena*, *Parallaxes*, *Magnitudes*, *Motions* and *Distances* of the *Planets* and their *Satellites*; and in particular, the Incomparable Sir *Isaac Newton's Theory of the Moon*, and a very large Account of *Comets* from the same Author. You will have also the Ground and Practice of *Dialling*; the Nature and Use of *Opticks*; the taking all *Heights* and *Distances*; the *Mensuration* of *Surfaces*; *Gauging*; the *Art* of *Chronology*, *Geography*, *Cosmography*, *Musick*, &c.

In *Gunnery* you have the Method of Shooting in Great Guns and Mortars, with Captain *Halley's* and *Anderson's* Tables; and as to *Fortification*, I have consulted the best Books and Drawings; and I believe the several Parts of a fortified Place are pretty well described, and the Plate belonging to this *Art*, at the End of the Book, comprehensive, and done according to the best of the Modern Ways.

The Figures also of the Five Orders of Pillars in *Civil Architecture*, are, I hope, as instructive as they cou'd be of that Size; and as for the Terms of Art here, I took them from the best Author, as *Vitruvius*, *Vignola*, *Palladio*, and the *Parallel* by Mr. *Evelyn*.

Navigation is also largely treated of, and the whole *Art* taught under the Words *Plain* and *Mercator's Sailing*, and *Traverses*: And as to the *Variation of the Compass*, I have given you a very full and exact Account of it, from the Excellent Mathematician Capt. *Halley*, together with his Ingenious Hypothesis for the Solution of its Variation; and Practical Rules to find the Variation of the Compass at Sea.

And as to a Ship, I have endeavoured to be very full and particular in describing the several Parts of her, both in the *Dock*, when *Building*, and when *Rigg'd*, and *under Sail* at Sea: For I have consulted the best *Draughts*, *Sections* and *Models* I could get a sight of, have got what Helps I could from Captains and Masters of Ships, and have often gone on Board my self, to get the more ready Knowledge of this Affair; and I have compared it all with what we have already Printed of this Nature in Books and Descriptions of Ships; such as *Manwaring's Sea Dictionary*, *Boteler's Sea Dialogues*, *Philips's Section of a First Rate*, &c.

I have given also, from several Eminent Hands, and several Ways, the *Laws of Motion*: As from Dr. *Wallis*, Sir *Isaac Newton*, Monsieur *Varignon*, Mr. *John Keil*, &c.

And the Doctrine of *Mechanicks*, *Nature* and *Properties* of *Statics*, the *Laws of Pendulums*, and of *Projectiles*.

And

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And I have been very large in that most Useful Science *Hydrostatics*, giving an Account of the Principles and Practice of the *Art*, both Mathematically and Experimentally: And under the Word *Specifick Gravity*, I have given you all that the Honourable Mr. *Boyle* hath advanced on that Subject, in his *Medicina Hydrostatica*; to which a large Table of the *Specifick Gravities* of different Bodies is added; and all his *Hydrostatical Paradoxes* are inserted in their proper Place.

I have describ'd also, chiefly from Mr. *Derham*, the way of *Calculation of Automata*, or Clock and Watch-work; and explained the Terms of *Art* used in *Painting* and *Sculpture*.

As to *Physick* and *Natural Philosophy*, and those admirable Helps to the understanding of Nature, which *Geometry*, applied to *Physical Enquiries*, hath of late afforded us, and to which indeed we are chiefly indebted to that Prodigious Mathematician Sir *Isaac Newton*: I have endeavour'd to give you every where the Marrow and Substance of it under proper Heads: And under the Term of *Art*, or Word, expressing any particular *Quality*, I have collected all I could meet with to explain it, and to clear up its Nature and Properties; as you will find at large under such Words as *Electricity*, *Solidity*, *Elasticity*, *Effluvi-ums*, *Magnetism*, *Light* and *Colours*, &c. As to which last, I'm sorry I had not time to take no more from Sir *Is. Newton's* Excellent Book of *Opticks* lately published; what I could, I have insert'd, as I had before done the Substance of what he had published in the *Philosophical Transactions* on that most Noble Subject; and which convinces us that we were all mistaken in our Notions about it before, for want of proceeding in a right Method of Enquiry.

The *Phænomena* of the *Rain-bow*, or *Iris*, are here accounted for from the Learned and Ingenious Capt. *Halley*, now *Savilian Professor* of *Geometry* in *Oxon*.

The Account of *Snow* I give you from Dr. *Grew*: And one of *Ice* from the *French*.

I have collected what I could meet with as to *Sound*; but I wish that *Quality* were a little better considered.

You have here a very full Account of all the *Phænomena* and *Properties* of the *Air* and *Atmosphere*, as its *Gravity*, *Spring* or *Elasticity*, &c. and a full Description of, and the Use of such Instruments as have been invented to enable us to judge of them; as the *Barometer*, *Thermometer*, *Hygrometer*, &c. all which is chiefly from the Honourable Mr. *Boyle* and the *Philosophical Transactions*.

The Account of *Springs* and *Fountains* is from Capt. *Halley* and Dr. *Woodward*: And from the former of these Learned and Ingenious

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nious Gentlemen I have given you a new Theory of *Tides*, or a Solution of the *Phænomena* of the Ebbing and Flowing of the *Sea*, which is very plain, certain and intelligible, and built on Sir *Is. Newton's* Principles.

In *Botany* I have been as large as I could be, without giving Descriptions of Plants, which is contrary to my Design: But you have here, from our Mr. *Ray*, *Morrison*, and Monsieur *Tournefort*, I believe, a pretty exact *Botanick Lexicon*, which was what we really wanted before: Together with an Account of all the several *Kinds*, and *Subalternate Species* of *Plants*, and their *Specifick Differences*; in which I have followed Mr. *Ray's* Method, as appearing to me to be the best and most Natural.

A Table of *Fossils* I have given you from the Accurate Dr. *Woodward*, Professor of Medicine in *Gresham-College*: And a Scheme of *Metals* and *Stones* from Bishop *Wilkins's* Real Character.

I have also given you a large Account of *Vegetation*, which is very curiously and exactly done from the Experiments and Observations of Dr. *Woodward*.

You have here also a good Account of the Nature and Property of the *Wind*, from Capt. *Halley*: And a Description of Mr. *Papin's* *Wind-Gun*, from Mr. *Boyle*.

From which last Excellent Gentleman I have also taken what I say about the Nature and Properties of *Cold*.

And likewise from Capt. *Halley* and Sir *Is. Newton*, is collected all that which you will find under the Word *Heat*.

In *Chymistry*, the Knowledge of which is one great help towards the Understanding of Nature, I have been large and particular; explaining the Chymical Principles, Vessels, and Degrees of Fire; and have omitted no Process nor Operation of Use, that I could either meet with in Books, or get from my Friends; as the Reader will soon see, by consulting the Book it self, under such Words as *Phosphorus*, *Bolonian Stone*, *Sympathetick Inks*, *Transmutation*, &c.

In *Anatomy* I have been very large and full, describing all the Parts of an Humane Body, both Internal and External: And tho' indeed the Figures for this Part are much less than I could have wished them to be, (for the Book hath so much out-run the Expence the Undertakers at first proposed, that they would not be brought to have larger Cuts;) yet I hope the Descriptions, in most Places, will prove tolerably Accurate and Instructive; especially under such general Words, as *Blood*, *Circulation*, *Bones*, *Heart*, *Ear*, *Eye*, *Vision*, *Arteries*, *Veins*, *Bile*, *Lympha*, *Chylification*, &c. in all which I have consulted the Best Authors.

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In *Logick*, *Metaphysicks*, *Ethicks*, *Grammar*, *Rhetorick*, &c. I have been designedly short; giving usually the bare Meaning only of the Words and Terms of Art, with one or two Instances to explain them, and illustrate them.

In *History* and *Chronology*, you have what properly belongs to them as *Arts*; as an Account of the *Civil* Computation of Time; the Original and Reduction, one to another, of the several *Æra's*, *Epocha's*, *Periods*, &c.

In *Heraldry* I have given you the entire Art of *Blazoning* and *Marshalling* a *Coat of Arms*; and explained all the *Ordinaries*, *Charges*, *Bearings*, &c. by Figures: But have said nothing of Families (any further, than that such a Coat belongs to such a Name) my Design being only to explain the *Art* and its *Terms*.

As to the Description of the *Mathematical* and *Philosophical Instruments*; some of them (as the most useful) are largely done, but the others as briefly: For as it would have taken up a large Volume to have described them all; so for many of them, the Reader would not have been much the better. But the *Globes* and *Quadrants* are largely treated of, as are *Telescopes*, *Microscopes*, *Baroscopes*, *Hygrosopes*, and the *Pneumatick-Engines*, or *Air-Pumps*; because these are of vast Use and Benefit to Mankind, and have served to improve and raise up the Knowledge of Nature to that good Height it is now arrived to, and I hope will carry it yet much further.

And as I have usually taken particular Care to give all Authors their just Due, from whom I have taken any considerable Part of my Materials, without Partiality, so I have designedly done Justice to such Ingenious and Industrious Artificers, as do truly deserve the greatest Encouragement for their Skill and Accuracy, in the making of those Instruments: Such are Mr. *John Rowley*, *Mathematical Instrument-maker*, under St. *Dunstan's-Church* in *Fleet-street*: Mr. *Yarwell* late, and Mr. *Marshal* now, *Perspective-Makers* in *Ludgate-street*: Mr. *Hawkesbe*, who makes *Air-Pumps* and all *Pneumatick-Engines*, in *Wine-Office Court* in *Fleet-street*: And Mr. *John Patrick*, the *Toricellian Operator* in the *Old-Baily*, who makes all kinds of *Barometers* and *Thermometers*; as you will find I have done in the proper Places: And I can't here omit mentioning the Ingenious Mr. *Wilson*, which I could not do in the Book, because those Sheets about the *Microscope* were Printed off before I had seen Mr. *Wilson* or his Glasses: But I must now do him that Justice to say, That of all the *Microscopes* I have ever seen for Commodiousness, various Uses, Portability, and Cheapness, I never met with any thing like Mr. *Wilson's* Glasses. They are particularly described in the *Philosophical Transactions*, N.

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As to the *Law Part* of the Dictionary, I did my self actually consult the best Books and Dictionaries I could get recommended to me; and from thence I transcribed, abridgedly, all that seem'd necessary to be inserted here; and since that, I have had it carefully examined and corrected by a Gentleman of known Ability in that Profession.

And thus having given you a short Account of what you may expect to find in this Work, and which may perhaps satisfy the Reader that it is a Book useful to be *read carefully over*, as well as to be consulted like other Dictionaries occasionally: I shall next fairly acquaint you wherein it is defective, and what Improvements may be made of it hereafter, in an additional Volume.

The Catalogue, Right-Ascensions, Declinations, &c. of the *Fixed-Stars*, is very imperfect; the Reason of which is, That Mr. *Flamsteed*, upon whom I thought I might depend, was pleased to refuse me any Communication of that kind; else I would have given those Things under the Name of each Star or Constellation.

There are also, I doubt, here and there some Words which my *Amanuensis*, or *Assistant*, transcribed from other Dictionaries, which are not so well explained as they should be, and which (among so many Thousand Words as I had to range into Order) have escaped a Review; but I have corrected as many of them as I could in each Sheet as the Book was printing off.

I would have had also at the End of the Book, a particular *Alphabet* for each *Art* and *Science* by it self; and some more and larger Copper-Plates in *Anatomy*, and of the *Outside, Rigging*, and the *Section* of a *Ship*: But the Undertakers could not afford it at the Price proposed, the Book having swelled so very much beyond the Expectation: But whatever Alterations, Amendments, Improvements and Additions shall be hereafter, as I question not but many of the latter sort Time will produce, if God please to Bless me with Health and Leisure, these shall all be printed in a Volume by themselves, and so by no Means be prejudicial to the first Impression.

LEXICON

LEXICON TECHNICUM;

OR AN

UNIVERSAL ENGLISH

DICTIONARY

OF

Arts and Sciences.

ABA

ABACOT, the Cap of State, used in old time by our *English Kings*, wrought up in the Figure of two Crowns.

ABACTORS, the same with *Abigei*, such as steal and drive away whole Flocks of Cattle, or the greatest part of any Herd or Flock; in which the Lawyers distinguish them from *Fures*, who only steal a Sheep or two, &c.

ABACUS, sometimes signifies the A, B, C, sometimes a Table of Numbers for casting up Accounts, which was anciently of Brass, and called then, *The Table of Pythagoras*. It signifies also, sometimes the Numeral Figures, which used to be drawn on a Table covered with small Sand or Dust, as *Persius* hints in these Verses.

*Nec qui Abaco numeros et secto in pulvere notas
Scit resisse vafer —.*

ABACUS, in Architecture, is the four square Table that makes the Capital on the Top of a Column, especially those of the *Corinthian Order*: and is a Drip or *Corona* to the Capital. It supports the nether Face of the Architrave and whole Trabeation. In the *Corinthian* and *Composite Orders*, the Corners of it are called; the *Horns*, the middle part the *Sweep*, and the *Curvature* the *Arch*; which commonly has a *Rose* carved in the middle. See Vol. 2.

ABAFI, or *Aft*, a Sea Term, signifying always those Parts which are towards the Stern of the Ship: So they say, Such a Mast hangs *Aft* or *A-baft*, that is, towards the Stern. And because the Master's or Captain's Cabbin is usually in the hinder part of the Ship under the Quarter Deck, 'tis a common Complement to a Person come on Board a Ship, *Sir, will you please to walk Aft*.

ABALIENATION, a Term in the old Roman Law, signifying a simple Sale of the Goods of one Citizen to another: These Goods were called, *Res mancipii*, or *mancipii*; and were Estates either in Slaves or Cattle, and sometimes Land of Inheritance; but they must be in *Italy*.

ABA

ABAPTISTON, or *Ana-baptiston*, an Instrument used by Surgeons, the same with *Modiolus*, which see.

ABATE, *Abatement*, signifies in Law the taking Possession of Land by a Person that hath no right to it, after the Death of the Ancestor, and before the Entry of the right Heir. Also to *Abate a Writ*, signifies to destroy it for a time, thro' want of good Ground, or other Defect. So to *Abate a Nuisance*, is to destroy it, &c.

ABATEMENT of Honour, in Heraldry, is an accidental Mark annexed to a Coat of Arms, whereby its Dignity is abated by reason of some dishonourable Quality or Stain in the Bearer, and 'tis either by adding a *Mark of Diminution*; or by *Reversion* of the whole Escutcheon. The Marks of *Diminution* are, 1. A *Delf Tenn*, which is a Square born in the middle of the Field, thus; and belongs to one that hath revoked his Challenge, or eaten his Words.



2. A *Point Dexter parted Tenn*: due to him that is a *Braggadocio*, or boasts of more than he did, or can do.



3. A *Point in Point Sanguine*, thus; due to him that is Lazy and Sloathful in the Wars.



4. A *Point Champain Tenn*: which is due to him that kills his Prisoner after Quarter demanded and his Commander's Leave to give it; born thus.



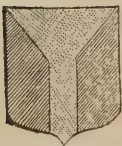
5. A *Plain*



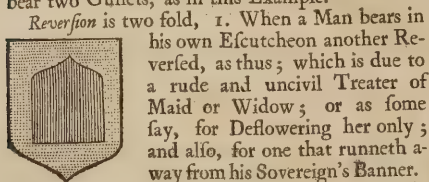
5. A Plain Point Sanguine, born thus; due to one that is a Liar, and tells false Stories to his Sovereign.



6. A Goar Sinister Tenn, born thus; and is due to him that is proved a Coward: But a Goar Dexter is not an Abatement.



7. A Gusset Sanguine, born thus; where are two Gussets one on each side. The Gusset is an Abatement proper for an Effeminate Lascivious Man; and is then born on the right side; but if he be given to too much Wine, the Gusset is on the left side; if to both, he should bear two Gussets, as in this Example.



Reversion is two fold, 1. When a Man bears in his own Escutcheon another Reversed, as thus; which is due to a rude and uncivil Treater of Maid or Widow; or as some say, for Deflowering her only; and also, for one that runneth away from his Sovereign's Banner.

2. When a Man's own Escutcheon is entirely Reversed, which is due to a Traitor.

N. B. These Abatements are never charged with any thing; are always born single, and their Colour is never of Metal, but always either Murrey or Tawney.

ABATOR, (in the common Law) is he that abaterh, that is, intrudeth into a House or Land void by the Death of the former Possessor, and not yet entered, or taken up by his Heir.

ABBROCHMENT, is the forestalling of a Market or Fair, by buying up the Wares before they are exposed to Sale in such Market or Fair, and then vending them again by Retail.

ABBUTTALLS, are the Buttings and Boundings of Lands any way, shewing how they lie in respect to other Places.

ABDICATION, a Term of the Roman Law, signifying several things; as the Abandoning of a Son, when he was expell'd his Father's House and refused to be owned as his Child. *Abdicare Magistratum*, or *se Magistratum*, was to abandon or lay down the Office of a Magistrate. We meet there also with *Abdicare se statu suo*; which signifies, a Man's renouncing his Condition to become a Slave, and to be degraded from the Privileges of a Roman Citizen.

ABDICERE, signifies, to debar a Man from his Demands, or not to allow them: Thus *Abdicere vindictas* was in the Roman Law not to allow a Man the Possession of thing in Controversie, as *Addicere vindictas* is the very contrary.

Tho' the Word *Abdication* signifies strictly an actual and voluntary Renouncing, yet in a larger Sense, at common Law, it may be properly used where there is only an *Implicit Renunciation*; as when a Person does such Actions which are inconsistent with the nature of his Trust, he does in consequence renounce it; and this was the late famous Case of a certain Prince, where this known

and ancient Common-Law-Term was revived; tho' indeed 'tis more generally used among the Civilians.

ABDOMEN, the lowermost of the three *Venters* in an Human Body; properly the Lower Belly: It contains in its Region the Stomach, Guts, Liver, Spleen, Bladder, &c. within it is covered with a Membrane called the *Pertitonæum*. The lower part of it is called the *Hypogastrium*. The foremost part is divided into the *Epigastrium*, the Right and Left *Hypochondria's*, and the Navel. 'Tis bounded above by the *Cartilago Encephalis* and the *Diaphragm*, sideways by the short or lower Ribs, and behind by the Vertebres of the Loins, the Bones of the *Coxendix*, *Pubis* and *Os Sacrum*. It hath ten Muscles which both cover it and serve to excrete the *Fæces* and *Urine*, and to expel the *Fœtus* in Women: You will find them under their proper Names.

ABDUCTOR Indicis, is a Muscle of the Fore-Finger, which is not to be seen till the *Abductor Pollicis* is raised; by some it is reckoned amongst the *Interossei*; it arises fleshy from the *Os Metacarpi* that sustains the Fore-finger, and descending over the first Internode of the said Finger becomes Tendinous, joining with the Tendon of one of the Lumbrical Muscles, and is inserted with it together with the Tendon of the former Muscle. Its Name intimates its Use, in drawing the Fore-finger from the rest.

ABDUCTOR Oculi, a Muscle of the Eye, so called from its Action in retracting or drawing off the Eye from the Nose: It is also called *Indignabundus*, because it is made use of in scornful Re-
sentments.

ABDUCTOR minimi digiti, is a Muscle which appears in some Bodies divided into two or three Muscles, having each a differing Series of Fibres; the first of which seems to be a *Flexor primi Internodii minimi digiti*, the second an *Abductor* of the same; the third *Abductor Secundi & Tertii Internodii*; but this Division is not constant. It arises fleshy, first, from the *Ligamentum Transversale* and fourth Bone of the *Carpus*; Secondly, from the third Bone of the *Carpus*; and then, Thirdly, from the superior Parts of the subjacent *Os Metacarpi*: The two first continue fleshy to their Insertions; the former terminating at the superior Part of the first Bone of the Little-Finger forwards; the latter ending at the same part of the said Bone laterally; the Third becoming Tendinous like the *Interossei*, is inserted like them with the Tendon of the *Extensor Minimi Digiti* at the superior part of the third Bone of the Little-Finger. Its Use is to draw the Little-Finger from the others.

ABDUCTOR Pollicis, is a Muscle of the Thumb, which arises broad and fleshy from the internal part of the *Ligamentum Transversale Carpi*, whence descending it lessens it self, and becomes Tendinous, at its Implantation to the superior and external part of the second Bone of the Thumb laterally. This draws the Thumb from the Fingers, from whence it derives its Name.

ABDUCTOR Pollicis Pedis, is a Muscle which arises fleshy from the *Os Calcis* internally and laterally, in half its Progress becoming Tendinous, it joins with another fleshy beginning, springing from the *Os Cuneiforme Majus* that sustains the *Os Metatarsi* of the Great Toe; both which making one Tendon are inserted to the external part of the *Os Sesamoides* of the Great Toe laterally. This pulls the Great Toe from the rest. **ABDU-**

ABDUCTOR *Minimi Digiti Pedis*, is a Muscle which ariseth outwardly Tendinous, but inwardly Fleshly, from the external part of the *Os Calcis*, becoming Tendinous in half its progress on the outside of the Foot; it joyns with the other fleshy part of this Muscle arising fleshy from the outside of the *Os Metatarsi* of the Little Toe, and making one Tendon as its Insertion to the upper part of the first Bone of the Little Toe externally and laterally. Its Use is to draw off the Little Toe from the rest.

ABDUCTORES, in the general are the same with *Abducent Muscles*.

ABDUCENT *Muscles*, are universally those which serve to open or pull back divers parts of the Body, as the Arms, Legs, Eyes, Nostrils, Lips, &c. These are called also *Abductors*. Their Opposites are usually called *Adductors* or *Adducent Muscles*.

ABETTERS, is a common Law Term, and signifies those that without Cause procure others to sue out false Appeals of Murder, or Felony against Men, in order to render them infamous.

ABETTERS, in Murder, are those which advise or procure a Murder to be committed; in the same sense there are *Abettors* in Felony and Treason; in the last of which they are all *principals*, there being no *Accessories* in Treason.

ABELTION, the Licence given to a Criminal Accuser, to desist from further Prosecution.

ABEYANCE, in Law signifies a Thing's being in *Possessio* only and not in *Actu*: Thus suppose a Lease made to *A.* for Term of Life, and the Remainder to the right Heir of *B.* who is living at the time of the Grant; in this case, tho' the Remainder pass presently from the Grantor, yet it vests not presently, or takes hold in the Grantee, that is the Heirs of *B.* but is Indeterminate, in *Potentia*, in *Nubibus*, in *Abeysance*, viz. in Consideration of Law: So when the Parson of a Church dies, and the Church is void, the Fee is in *Abeysance*, because it is not determined who shall succeed him.

ABISHERISING, and in some Copies, *Misbehaving*, is (in Common-Law) being acquitted of *Amercements*, before whomsoever, of Transgression prov'd.

ABJURATION, formerly was an Oath which a Person who had committed Felony, and who, to avoid the Law, had betaken himself to Sanctuary, took to depart the Kingdom for ever: It was a Law enacted by *Edward the Confessor*, but is since changed by the Statutes, 21 H. 8. c. 2. 22. H. 8. c. 14. 32. H. 8. c. 12. But the Sense of the Word *Abjurate*, originally, in the Roman Language, as it is used by *Cicero* and other good Writers of that Age, was, To deny a thing upon Oath; to deny that a Man had promised, committed, detained, or did owe any thing, upon his Oath. Thus with him *Abjurare Creditum* was to forswear a Debt, or to deny on Oath that he ow'd the Debt.

ABLACATION, the weaning of a Child that hath suck'd its full time. Also a kind of Grafting, when the Cyon remaineth on its own Stock, and the Stock you graft it on, together, till such time as they are surely incorporated; then the Cyon is cut from its own, and lives only by the other Stock.

ABLAQUEATION, a laying open or baring the bottom of the Trunk, and Roots of Trees, that so being exposed to the Air, the Sun, and the Rains, they may the better fructify, or bear fruit the ensuing Year.

ABLATIVE Case, is the last of the six Cases of Nouns and Participles in Grammar, and is so call-

ed, because it usually takes away one thing from another. This called also the *Latin Case*, because almost peculiar to the Latin Tongue, and is usually connected with some Prepositions, which serve to determine it.

ABLUTION, the Preparation of a Medicine in any Liquor, to cleanse it from its Impurities.

ABLUDENT *Medicines* are the same with *Absfergent*, which see.

ABNODATION, in Agriculture, signifies the pruning of Trees, and cutting off Knots and Knobs.

ABOLITION, in Metaphysics, is an utter Destruction of any Being.

ABOLITION of a Law, is the perfect repealing it, or the entire taking of it away, so that it shall never have Force again.

ABOMASUS, one of the Stomachs of Ruminant Animals or such as chew the Cud; of which are reckoned four, the *Venter*, *Reticulum*, *Omasus*, and *Abomasus*.

ABORIGINES, are such Nations as the *Italians*, who pretend antiently to be without Original or Derivation from any other Nation or People.

ABORTION, the bringing forth of a Child (or *Fœtus*) before its due time.

ABORTIVE, is spoken of a *Fœtus* brought forth before its time: Hence 'tis also an Epithet given to any Design or Purpose that miscarries.

ABRENUNCIATION, is a renouncing or forsaking of any thing entirely.

ABBREVIATIONS, are Contractions in Writing or otherwise, whereby any thing that is written or spoken, is contained in, or takes up much less Room, than it would do, if written or delivered at large.

ABRIC, with some Chymists the same with *Sulphur*.

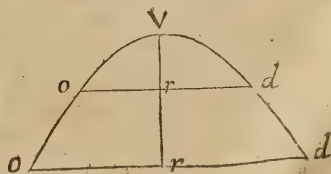
ABRIDGMENT of a Plaint, in Common-Law, is, when one Part of the Plaintiff's Demand is left out, and it is pray'd that the Defendant may answer to the other.

ABROGATE, signifies to disannul or repeal; as to *Abrogate* a Law, is, to lay it aside or to repeal it. So that the

ABROGATION of a Law, is the repealing it, or taking it quite away.

ABSCESS, an Ulceration arising in any Part of the Body after a *Crisis*: The same with *Apoistema*.

ABSCISSÆ, in Conick Section, or other Curvilinear Figure, are the Parts of the Axis cut off by the Ordinates, and accounted downwards from the Vertex of the Section. Thus *Vr* or *V R* are the *Abscisse* in this Figure. These are called by some Writers, the *Intercepted Axes* or *Intercepted Diameters*.



ABSIS, the same with *Apfis*, which see.

ABSOLUTE: This Word (which signifies free from the Power of another) is variously used. Sometimes the Terms of a Proposition are said to be taken *Absolutely*, that is, without relation to any thing else. A Prince is said to be *Absolute*, when

he makes his *Will his Law*, and will in no respect be restrained or limited by the Laws of his Country. This is otherwise called Arbitrary Power; and arises from an Imperfection both in the Understanding of the Prince, and in the Spirits of the People. But God Almighty is *Absolute* from the Perfection of his Nature, as containing in himself all possible Power, and lying under no Limitations nor Restraints from any one. *Absolute* is sometimes taken also in Opposition to Terms or Conditions; thus God doth not forgive Men their Sins *Absolutely*, but on Condition of their Repentance and Amendment; and a Priest cannot absolve Men from the Guilt of their Sins *Absolutely*, but only declaratively and Ministerially, on the Condition of the Person's Penitence and Resolutions for Amendment. So (in Law) an *Absolute* Estate is one free from all manner of Conditions.

ABSOLUTE Number, in an Equation in *Algebra*, is that which *Vieta* calls the *Homogeneous Comparisonis*, and which always possesseth one entire part or side of the Equation, and is always a known Quantity; and the Rectangle or Solid, under the unknown Roots, in Quadratics and Cubics. Thus in this Equation $ax - 16a = 36$. The Absolute Number is 36, which is equal to the Product of the two Roots or Values of a , multiplied one into another.

ABSOLUTE Equation, in *Astronomy*, is the Aggregate or Sum of the Eccentric and Optick Equations. See *Equation*.

ABSORBENTS, are Medicines that temper and qualify the Acid Juices in the Body, by imbibing or drinking them up. Thus *Alkali's* are said by some to absorb Acids.

ABSTENSION, in Law, is a with-holding an Heir from taking Possession of his Land.

ABSTERGENT, or *Absterfifile* Medicines, are such as are used to clear the Skin or Superficial Parts of the Body from any Filth, &c. obstructing its Pores.

ABSTERSION, is the Effect produced by *Absterfifile* Medicines, or in general, any cleansing or wiping away.

ABSTRACTION, is a Power peculiar to the Mind of Man, in Contradistinction to the Souls of Beasts, and plainly distinguishes Him from Them; whereby he can make his Ideas, arising from particular Things, become general Representatives of all of the same kind. Thus, if my Eye represents to me Whiteness in a Wall, I can *Abstractedly* consider that Quality of Whiteness, and find it attributable to many other things besides, as to Snow, to Milk, or the like; and this Quality, whatever it be, thus considered apart from the *Concrete*, or the Subject in which it inheres, is said to be taken in the *Abstract*.

ABSTRACT, is frequently used also for a small Draught or Epitome of any greater Work.

ABSTRACT Numbers, are those which are considered as *Pure Numbers*, without being applied to any Subject; and so *Abstracted Mathematics*, is used in Opposition to *Mixt Mathematics*; the former signifying pure *Geometry* or *Algebra*; and the latter Opticks, Dialling, Navigation, &c. where Physical Considerations are connected with the Mathematical.

ABSTRUSE, secret, dark, not easily intelligible.

ABUNDANT Numbers, are those whose Parts added together, make more than the whole Number which they are Parts of; as v. g. Twelve,

whose Parts being 1, 2, 3, 4, and 6. these all added together make Sixteen: Thus also the Parts of 20 make 22, &c.

ABUS, see *Apfis*.

ABYSS, is any vast deep Place, which either hath no Bottom, or else hath none discernable, or at least is supposed to have none.

The Learned Dr. Woodward, in his *Natural History of the Earth*, P. 124. tells us, That there is a mighty Collection of Waters inclosed in the Bowels of the Earth, constituting an huge Orb in the Interior or Central Parts of it; and over the Surface of this Water, he supposes the Terrestrial *Sratta* to be expanded: This is what *Moses* calls the *Great Deep*, and what many Authors call the *Abyss*. And that there is such a vast Collection of Waters lodged in the Bowels of the Earth, is confirmed by abundance of Observations.

The Water of this vast Abyss the Dr. asserts, doth communicate with that of the Ocean by means of certain Holes, *Hiatus's* or *Chasms* passing betwixt it and the Bottom of the Ocean: And this and the Abyss he supposes to have one common Centre, around which the Water of both of them is placed; but so, that the ordinary Surface of the Abyss is not level with that of the Ocean, nor at so great a distance from the Centre as that is, it being for the most part restrained and depressed by the *Sratta* of Earth lying upon it; but wherever those *Sratta's* are broken, or so lax and porous that Water can pervade them, there the Water of the Abyss doth ascend, fills up all the Clefts or *Fissures* whereinto it can get Admittance or Entrance, and saturates all the Interstices and Pores of the Earth, Stone, or other Matter all around the Globe, quite up to the Level of the Ocean.

ACADEMY, is a kind of higher School or University, where young Men are instructed in the Liberal Arts and Sciences. 'Twas so called at first from *Academia*, the Name of a Place near *Arbens*, and built, say some, by *Cadmus* the Phœnician; others, by one *Academos*, whence it had its Name: 'Twas planted with Trees; and here *Plato* taught his Disciples Philosophy, who from hence are called *Academicks*. *Cicero* also call'd one of his Country Seats by this Name, where he had fine Groves, and pleasant Walks for the Entertainment of his Philosophical Friends; and here he wrote his Books, *D. Nat. Deorum* and *De Amicitia*, and his *Offices*, which therefore he called his *Academical Treatises*.

ACADEMICKS, so the Followers of *Plato* were anciently called, because they studied in the *Academia*. Afterward it became the Name of a Sect of Sceptical Philosophers, who maintained, That all things were uncertain, and that Reason and Truth were changeable, so that Men ought to doubt of every thing, and believe nothing.

ACANTABOLUS, the same with *Volsella* (excepting that the *Volsella* is crooked) a Surgeon's Instrument to take out any thing that shall happen to stick in the *Oesophagus* or Gullet; 'tis something like a Pair of Pliers, and may be reckoned as a kind of *Forceps*.

ACANTHA, is with some Anatomists the most backward Protuberance of the Vertebres of the Back; and is otherwise called, *Spina Dorfi*.

ACARNAR, the same with *Acherner*.

ACATALECTICK Verse, is one exactly perfect, where not so much as one Syllable is either redundant or deficient.

ACCEDAS

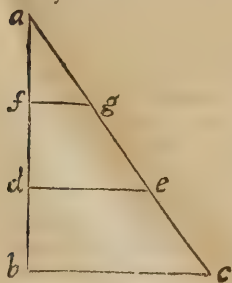
ACCEDAS *ad Curiam*; a Writ made out of the Chancery, and Returnable in the King's Bench or Common Pleas, and directed to the Sheriff, requiring him to go to the Court of some Lord, or Franchise, (where a Plaint is sued for taking of Cattle as a Distress, or any false Judgment supposed to be made in any Suit in such a Court, which is not a Court of Record) and there make a Record of the said Suit, in presence of the Suitors of the said Court, and also of four other Knights of the same County; and to certify it unto the King's Court, at the Day limited in the Writ.

ACCEDAS *ad Vice Comitum*, is a Writ directed to the Coroner, requiring him to deliver a Writ to the Sheriff, who having a Pone delivered to him, suppresses it.

ACCELERATION of the Descent of heavy Bodies was first discovered by *Galileus*: And if due Attention be given to our excellent *Sir Isaac Newton's* Second Law of Motion, *Axiom*, or Law of Nature, as it may be called, *viz.* That the Mutation of Motion is always proportionable to the Force impressed, and always is according to that same Line of Direction, the Reason of the Acceleration of the Descent of heavy Bodies, will be very clear and intelligible.

For, supposing Gravity (whatever it be) to act uniformly on all Bodies, at equal Distances from the Earth's Centre, and that the Time in which any heavy Body falls to the Earth, be divided into equal Parts infinitely small: Let Gravity encline the Body towards the Earth's Centre, while it moves in the first infinitely small Part of the Time of its Descent: If after this, the Action of Gravity be supposed to cease, the Body would go towards the Earth's Centre equally, with a Velocity equal to the Force of that first Impression, (by *Sir Isaac's* first Axiom.) But now since the Action of Gravity still continues; in the second Moment of Time the Body will receive a new Impulse downward, and then its Velocity will be double of what it was in the first Moment: In the third Moment or Particle of Time, it will be Triple; in the fourth Quadruple, and so on continually. Wherefore since those Particles of Time are supposed infinitely small, and all equal to one another, the Impetus acquired by the Falling Body, will be every where as the Times from the Beginning of the Descent. And since the Quantity of Matter in the Body given, continues the same, the Velocity will be as the Time in which it is acquired (as you will find proved in the *Laws of Motion*.)

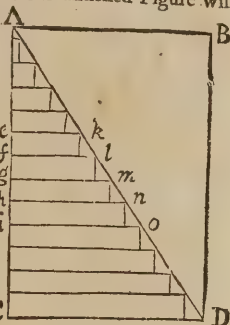
And after the same manner may it be proved, That the Motion of Ascending Projectives shall be equally retarded; for since the Force of Gravity acts continually and equally against the Motion first begun, it must diminish or abate the Motion, according to the Time of the Ascent, till at last it wholly ceases.



Let the Right Line ab express the Time of any heavy Body's Descent, and let bc at right Angles to it, denote the Velocity acquired at the end of the Fall. Draw ac , and any where the two Parallels fg , de , so they shall express the Velocities acquired in the Times of De-

scend af and ad . For because of similar Triangles, $ab, ad :: bc, de ::$ and as $ad, af :: de, fg$ wherefore 'tis plain, the Velocities are as the Times of Descent; that is, as the Lines or Elements of the Triangle abc , drawn parallel to the Base bc .

The Consideration of the annexed Figure will teach us, That if an heavy Body be thus uniformly accelerated in its descent; the Space which it describes from the beginning of the Time of its Motion, shall be just the half of that which it would have described, had it gone on for the same Time with a Velocity equal to what it had acquired in the end of its fall.



Let (as before) AC represent the Time of the Descent, DC the Velocity at last acquired; and compleat the Triangle ACD . Let also the Time AC be distinguished into an indefinite Number of small Parts, as ef, fg, gh, hi , &c. and draw the Parallels ek, fl, gm, hn, io , &c. to the Base CD . Then will ek be as the Velocity of the heavy Body, in the infinitely small part of Time ef , and fl will be the Velocity in the small Time fg , &c.

But now 'tis proved in the Laws of Motion, (see that Word) That the Space or Length described by any moving Body, in any given Time, and with a given Celerity; is as the Rectangle under the Time and the Celerity, wherefore the Space described in the Time ef , with the Celerity ek , will be as the Rectangle fke ; and the Space described in the Time fg , with the Celerity gm , will be as the Rectangle gl , &c. wherefore the Space run thro' in the Sum of all these Times, will be as the Sum of all the Triangles; that is, as the Triangle ACD , which contains them all. Again, the Space run thro' by the descending Body in the Time, AC , with the uniform Celerity DC (by the 7th Article of *Mr. Keil's Laws of Motion* above referred to) will be as the Rectangle $ABCD$. Wherefore the Space run over by the descending Body in the given time, and uniformly Accelerated) is to the Space described by the same Body, in the same Time with a uniform Celerity equal to what it at last acquires :: as the Triangle ADC is to the Rectangle $ABCD$. But the Triangle is one half of the Rectangle; wherefore the Space described by the Accelerated descending Body from the beginning to the end of its Motion, in a given Time, is just the half of the Space which would be described by the same Body if it had gone on, for the same Time, with a Velocity equal to what it had acquired in the end of its Fall. *Q. E. D.*

From whence it will follow, 1. That the Space run over with the Velocity CD in half the Time AC , will be equal to the Space described by the falling Accelerated Body, in the whole Time AC .

2. As the Triangle ACD represents the Space passed thro' in the Time AC , so the Triangle Aio , will represent the Space described by the falling Body in the Time Ai ; and the Triangle Aek , will represent that described in the Time Ae , &c. Wherefore

5. 'Tis plain, the Spaces describ'd, or the Distances run thro' in the Fall, will always be as the Squares of the Times: For the similar Triangles *ACD*, *Aio*, *Aek*, &c. are to one another as the Squares of their Homologous Sides *Ac*, *Ai*, *Ae*.

4. Wherefore if a heavy Body descending from its Place of Rest, describe any Length in a given Time, in twice that Time it will describe four times the Length; in thrice the Time, nine times the Length, &c. Or, in other Words, if the Times are considered in Arithmetical Proportionals, 1, 2, 3, 4, 5, &c. the Spaces described will be 1, 4, 9, 16, 25, &c.

5. Since the Space in the first part of Time is 1, in the second four, in the third 9, &c. if you consider the Space run through in the second Part of Time separately, it will be as 3; and if from 9, the Space described in the third part of Time, you take 4, the Space before described in the 2d Moment, there will remain 5, &c. wherefore supposing the Moments or Parts of Time equal, the Spaces described by the Descent of an heavy Body beginning from Rest, in each Moment considered separately, will be as the natural odd Numbers, 1, 3, 5, 7, 9, 11, 13, 15, 17, &c.

6. And since the Velocities acquired in falling, are as the Times; the Spaces run through will be also as the Squares of the Velocities; and both Times and Velocities will be in subduplicate Ratio of the Spaces described by any falling Body.

ACCELERATORES Urinae, are a pair of Muscles belonging to the *Penis*, whose use is to expedite the Urine and the *Genitura*: Our accurate Mr. Cowper saith, Authors have been mistaken in assigning the Origination of these Muscles, either to the *Sphincter Ani*, or to the Tubercles of the *Ossa Ischia*; for they arise Fleshly from the superior Part of the *Urethra*, as it passes under the *Ossa Pubis*, encompassing the external Part of the Bulb of its cavernous Body; both these Muscles meet on the inferior Part, and march on according to the Length of the Skin in the *Perineum*, when parting from each other, they ascend to their Insertions on each side the *Corpora Cavernosa Penis*. He thinks also, that they assist the *Erectores Penis*, by driving the Blood contained in the Bulb of the Cavernous Body of the *Urethra* towards the Glands in a greater Quantity, whereby it becomes distended: The Veins which carry off the Refluent Blood from the *Corpus Cavernosum Urethrae*, being at that time compress'd by the swelling of these Muscles.

ACCENSION, is the enkindling or setting any Body on Fire.

ACCENT in Grammar, is a Mark placed over a Syllable, to shew 'tis pronounced with a stronger or weaker Voice. The Greeks, who were the greatest observer of Accents, distinguish them into the *Acute* one mark'd thus, (´), the *Grave* one thus, (`), and the *Circumflex* thus, (ˆ). But of late one *Hennin*, a Dutchman, hath written a Book to prove the Accents were not ancient among the Greeks, and that that Language ought not to be pronounced according to them: He pretends no Accents are to be found in any MSS. above 800 Years old, and takes them to be an Invention of the *Arabs* about the time of *Mahomet's* Death. He says, the *Masforetes* of *Tiberius* brought them into the Bible about the Sixth Century, and that they were per-

fected by *Rabbi Judah Ben David Ching*, born in *Fer*, about the Eleventh Century.

ACCENTS, in Grammar, shew how to judge of the Measure of Time, in which each Letter, Syllable, Word, or Expression is pronounced; the Elevations and Depressions of the Voice, the Silence or Repose of the Voice at the End of Words or Sentences, &c. These Accents may be very numerous: There are in the Hebrew Grammars more than thirty of them, and *Servius Honoratus* reckons eight in the Latin.

The *Acute Accent* shews when the Voice is to be raised, and is expressed thus (´).

The *Grave Accent* shews when the Voice is to be depressed, and is figured thus, (`).

The *Circumflex Accent* is compos'd of both the *Acute* and the *Grave*, and is expressed thus, (ˆ).

The *Long Accent* shews that the Voice is to stop upon the Vowel that has that Mark, and it is expressed thus, (ˉ).

The *Short Accent* shews that the time of Pronunciation ought to be short, and is marked thus, (˘).

Hyphen, is an Accent in Grammar, that implies two Words are to be joyned, as *male-fans*.

Diastole, is an Accent in Grammar, which shews that those Words or Sentences to which it is adjoyned are to be separated, its Mark is (,).

Apostrophe, is an Accent in Grammar, shewing there is a Vowel to be rejected, and is expressed thus, (') and placed over the Head of the Letter.

ACCENT in Music, is a Modulation of the Voice, to express the Passions either Naturally or Artificially.

ACCEPTANCE, in Law, is an agreeing to some Act already done, which without such Agreement, might have been undone or avoided; as if a Man and his Wife seized of Land in Right of his Wife, do joyn and make a Lease by Deed, reserving Rent, and the Husband dying, the Wife accepts or receives the Rent: By this *Acceptance* in her, the Lease is made good, and shall bar her from bringing a *Cui in vita*.

ACCEPTILATION, in Civil-Law, is the same with *Acquittance* in Common-Law, being a Verbal Discharge from the Creditor to the Debtor.

ACCESS or *Accession*, the Fit or *Paroxysm* of a Disease.

ACCESSIBLE Height, is either that which may be mechanically measured by the Application of a Measure to it, or else an Height whose Base and Foot can be approached to; and from thence a Length measured on the Ground.

ACCESSORIUS Willisii, is a Nerve which arises from the *Medulla Spinalis*, about the beginning of the sixth Pair of the Neck; as it ascends to the Head, it receives on each side a Twig from the first five Pair of Nerves of the Neck; as they rise from the *Medulla Spinalis*; then it enters the Skull, and passes out of it again with the *Par Vagum*, and is wholly spent upon the *Musculus Trapezinus*.

ACCESSORY, in the Common-Law, is a Person advising or procuring before the Fact, or aiding and assisting, receiving or protecting after it, one that hath committed Felony; who therefore shall have Judgment of Life and Member, as well as the Principal which did the Felony, but not till the Principal be first attainted, convict, or outlawed thereupon. A Man also may be Accessory to an Accessory, by aiding, receiving, &c. an Accessory to Felony. In the Statute-Law 'tis such an

as abetts, advifes, aids or receives one that commits Felony, which is made fo by Statute.

ACCIDENT: This Word is ufed by Logicians in three Senfes.

1. In Oppofition to the *Effence* of any Thing, whatever doth not effentially belong to it may (tho' a Subftance it felf) yet be an *Accident* or Adjunct to that Thing, or belong to it only accidentally, as the Cloths a Man hath on; the Money in his Purfe, &c. Thefe indeed are more properly called *Adjuncts*; and by the School-men are diftinguifhed by the Name of *Verbal Accidents*.

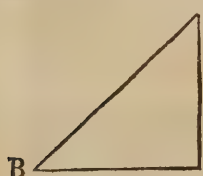
2. In Contradiftinction to the *Effential Properties* of any Subject, many Qualities are called *Accidents*; becaufe they are there not *Effentially* but *Accidentally*. This in the Schools is called *Accidens Pradicabilis*, and implies a *Common Quality*, which may or may not be in any Subject, as any particular Colour, &c.

3. In Oppofition to *Subftance*, a Thing is called an Accident, when it is its Effence or Nature to *Inhere* or fubfift in fome Subftance, and cannot be alone: And thus it is with all Qualities whatfoever. This is called *Accidens Pradicamentale*, and the nine laft *Pradicaments* are in this Senfe Accidents.

In reference to its *Caufe* alfo, or at leaft as to our Knowledge of it, a Thing is frequently filed an *Accident*, by which we mean an Effect either caufally produced, or which to us appears to have been fo.

ACCIDENTS (in Heraldry) are the *Points* and *Abatements* in an Efcutcheon; which fee.

ACCIDENTAL Point, in Perfpective is a Point in the *Horizontal Line*, where Lines parallel among themfelves, tho' not perpendicular to the Picture, do meet.



ACCLIVITY, is a Steepnefs reckoned upwards on a Slope Line, as *Declivity* is a steepnefs downwards. Thus *B A* is an *Acclivity*; *A B* a *Declivity*.

ACCOMODATE, fignifies amongst Geometers, to fit in a Line or Figure into a Circle, &c. fo as the Conditions of the Propofition or Problem require. See *Apply*.

ACCOMPT, a Writ in Law fo called, lying againft a Bailiff or Receiver, who will not give up his Accounts, or come to an Account for what he hath received. If the Auditors affigned him, find that he is in Arrears, they have Power by the Statutes of *Wefm.* 2. C. 10. to award him to Prifon till he have made Satisfaction: But if they won't allow him reasonable Charges, or if they charge him with more than he hath received, any Friend of his may fue out a Writ *Ex Parte Talis*, from the Chancery, directed to the Sheriff, to take out four Main-Pernors, to bring his Body before the Barons of the Exchequer on a certain Day, and to warn his Lord or Mafter to appear there at the fame time.

ACCORD, in Law, is an Agreement or Contract from one Man to another, to give him Satisfaction for fome Trefpafs or Damage done, which when executed and Performed, is a good Bar in Law againft an Action of Trefpafs for that Damage or Offence.

ACCRETION; nearly of the fame Senfe with *Augmentation*, and is properly an Addition of Matter to any Body externally: This is ufually faid of the encrease of Bodies without Life, and is fometimes called *Appofition* or *Juxta Pofition*. But fome will have the encrease of Living Bodies to be by *Introfumption* and *Affimilation* of the *Alimentary* or nourifhing Particles.

Dr. *Havers* in his *Ofteologia* gives this Account of *Accretion*, that the Nutritious Particles being feparated by the Glandules placed every where on the fides of the Arteries, are carried into thofe fmall Nervous Pipes, or Interftices of the Fibres where the Spirits move, fo that they fall in the way of the Spirit's Motion: Thefe Spirits he fuppofes to have a twofold Motion; one direct, the other *Rotatory* or turning round their *Axes*. While an Animal is capable of *Accretion*, and the Particles of which the folid Parts confift are not entirely united at their Extremities, but are capable of receding one from another, both end-ways and laterally; the Spirits act upon the Nutritious Particles (which are of a Vifcous Nature) by their *Rotary Motion*, by which they carry them to the fides of the Fibres and Bony Strings, driving fome againft the fides of their Parts, and forcing them out laterally: Others they drive into the Interftices between the Extremities, thereby lengthning every Series of them; where they are placed and fix'd, and thus the Parts of an Animal Body increafe both in Thicknefs and Longitude. But after the Particles are united at their Extremities, and no longer capable of making Room to lode the Nutritious Parts out of the way of the Spirits direct Motion; then the Spirits come to act upon the Nutritious Matter by that Motion, and to drive it fo through the Nervous Channels, that it has not the liberty of ftopping and adhering; and fo the *Accretion* of the Animal ceafes.

ACETABULUM, is that Cavity in the Huckle Bone which is appointed to receive the Head of the Thigh Bone within it: Alfo certain Glandules in the Chorion are call'd *Acetabula*, concerning which (fee *Coryledones*.)

ACERB, is a Tafte between Sowre and Bitter, fuch as moft Fruits have before they are ripe.

ACETUM Radicatum, is the sharpeft part of Vinegar, when the Phlegm is drawn off.

ACETUM Philofophorum; fo fome Chymifts call that four Liquor which is made by difolving a little Butter or Icy Oyl of Antimony in a confiderable Quantity of Water.

ACETUM Alcalifatum, is diftill'd Vinegar faturated with fome Alkalizate Salt.

ACHAMECH, with fome Chymifts fignifies the Drofs of Silver.

ACHERNER, a bright fixed Star of the firft Magnitude, in *Eridanus*, whose Longitude is 10. 31. of ♋, Latitude 59. 18.

ACHOLITE or *Acolite*, an inferior Church Servant, who, next under the Sub-Deacon, followed or waited on the Priests and Deacons, and performing the meaner Offices of lighting the Candles, and carrying the Bread and Wine, and paying other fervile Attendance.

ACHOR, is a fort of a crufted Scab which makes an Itching and Stink on the Surface of the Head, and is occafioned by a Serous, Salt and Sharp Matter: The difference betwixt an *Achor* and *Favus* confifts in this, that in *Achors* the Holes or Cavities are fmall, and fometimes not vifible; but

but in a *Favus* they are more large and conspicuous.

ACHLYS, according to some, is a kind of Darkeness in the Eyes, accounted one of the Species of *Amblyopia*, or Dimness of Sight.

ACHRONICAL, is used in Astronomy for the Rising of a Star when the Sun sets; or the Setting of a Star when the Sun rises; in which Cases the Star is said either to rise or set Achronically; which is one of the three *Poetical Risings or Settings*.

ACIDITY, is the Taſt which Bodies that are *Acid* or Sharp affect the Mouth with: And those Bodies are called

ACIDS, whose Particles are supposed to be longish, flexible, penetrating, and attenuating; and which have their Points sharp and piercing. And these are either *Natural Acids*; which have a proper Acidity of their own, without the help of Art, as Juice of Limons, &c. or else *Artificial Acids*; which are made by Fire in Chymical Operations. So that *Acid Spirits* or *Seygian Liquors*, as the Chymists call them, from their Powers to destroy or dissolve Bodies, seem to be nothing but an *Acid Salt* dissolved, and put into a violent Motion by the Fire: These are called *Acid Menstruums*. You may easily know whether any Liquor contain in it any *Acid Salt* or not, by dropping some of it on a little Syrup of Violets spread on white Paper; or in a Solution of Blue-bottle Flowers, &c. for then the Blue will be immediately turned into a Red or reddish purple Colour; whereas if it turn Green, 'tis a sign the Liquors abounds with Salts of an Urinous or Lixivate Nature; which how to distinguish, see those Words. The Acidity of any Liquor may also be concluded by its being able to destroy the Blueness of a Tincture of *Lignum Nephriticum*: (See Colours, and the ways of producing sudden Changes of them.)

ACIDULE, any Medicinal Waters that are not hot, like those at the Bath, which are called *Therma*.

ACINUS, in Botanicks, doth not signify a Grape-stone, but the Fruit it self of all such Plants which bear it, in a manner resembling Grapes: It is softer and more juicy than a Berry, and therefore distinguishable from it; as it is also because the *Acini* grow in Bunches or Clusters, and Berries often single.

ACINIFORMIS Tunica, is the same with the *Uvea Tunica* of the Eye.

ACMASTICK Fever, with some, is the same as *Synochus*.

ACME, in general, signifies the Height or Top of any thing; the Word is more especially used to denote the Height of a Distemper, many of which have four Periods. 1. The *Arche* or beginning. 2. The *Anabasis*, or Growth and Increase. 3. The *Acme*, when the Morbifick Matter is at the Height. 4. The *Paracme*, or the Declension of the Distemper.

ACOLITE, see *Acholite*.

ACONTIAS, a sort of Comets, shaped like a Dart or Javelin. Its Head is sometimes round, and sometimes oblong or compressed; and its Tail or Train is slender, but extended to a great Length.

ACOPUM, according to some Writers, is a Fomentation of warm and emollient things, to allay the Sense of Weariness, occasioned by too violent Labour or Exercise.

ACOSMY, is an ill state of Health accompanied with the Loss of the natural florid Colour of the Face.

ACOUSTICKS, are Medicines or Instruments which help the Hearing; as to the latter of which, the use of *Orocoastick Trumpets* is now very common; and no question Instruments of this kind are capable of Improvement. Dr. Hook in his Preface to his *Micrography*, saith, 'tis not impossible to hear a Whisper at a Furlong or $\frac{1}{4}$ th part of a Mile's distance: That he knows a way by which 'tis easy to hear any one speak thro' a Wall of a Yard thick: And that by help of a distended Wire, the Sound may be propagated to a very considerable Distance almost in an Instant.

ACQUIETANDIS Plegis, is a *Justicies*, that lies for a Surety against a Creditor, that refuseth to acquit him after the Debt is paid.

ACQUIETANTIA de Shiris & Hundredis, to be free from Suit and Service in Shires and Hundreds.

ACQUITTALE, in Law, signifies the Discharge of a Tenant from any Entries or Molestations, for any manner of Service issuing out of the Land to any Lord; that is, above the Mife. It signifies also, when two are indicted of Felony, the one as Principal, the other as Accessary; the Principal being discharged, the Accessary by consequence is also acquitted.

ACQUITTANCE, signifieth a Release or Discharge in writing of a Sum of Money, or other Dury, which ought to be paid or done.

ACRASY, is the Excess or Predominancy of one Quality above another, in the Constitution of a human Body.

ACRE of Land; its Quantity is four Square Roods; or 160 square Poles; or 4840 square Yards; or 43560 square Feet. By a Statute of 31 of *Eliz.* 'tis ordained, That if any Man erect a new Cottage, he shall add 4 Acres of Land to it.

ACRIMONIOUS Bodies, are those (in the General) whose Particles do eat, fret, destroy and dissolve what comes in their way, or which have a great *Acrimony*.

ACRISY, is such a State or Condition of a Disease, that no right Judgment can be made of the Patient whether he will recover or not.

ACROMION, is the upper Process of the Shoulder-Blade, or the top of the Shoulder, where the Neck-Bones are joined with the Shoulder-Blades.

ACROMPHALUM, is the Middle of the Navel.

ACRONICAL, see *Achronical*.

ACRONYCHAL, is the same with *Achronical*, which see.

ACROS, with some Writers is the Height of a Disease; and with some Anatomists, the Tops, or Prominences of Bones, &c.

ACROSPIRE, the same with *Plume*, which see.

ACROSTICKS; are a certain Number of Verses, whose initial Letters make up some Person's Name, Title, or some particular Motto.

ACROTHERIA or *Avoters*, signify in Architecture those sharp Pinacles and spiry Battlements, which stand in Ranges about flat Buildings, with Rails and Balusters: They signify also a sort of *Pedestal* to support Statues.

ACTINOBOLISM, is the same with the Diffusion or Diradiation of Light or Sound, by which its carried or flows every way from its Centre.

ACTION.

ACTION of a *Writ*, is a Phrase of Speech when one pleads some Matter, by which he shews, that the Plaintiff had no Cause to have the Writ which he brought; and yet it may be that he may have another *Writ* or *Action* for the same Matter.

ACTION upon the *Case*, is a *Writ* brought against one for an Offence done without Force, as for not performing Promise made by the Defendant to the Plaintiff, or for speaking of Words whereby the Plaintiff is defamed, or for other Misdemeanor or Deceit, &c.

ACTION *mix'd*; is when it is part *Real* and part *Personal*; and also is a Suit given by the Law to recover the thing demanded, and Damages for the Wrong done.

ACTION upon the *Statute*, is a *Writ* founded upon any Statute, whereby any Action is given to one in any Case whereby no Action was before.

ACTIONS *Personal*, are Actions whereby a Man claims Debt, or other Goods or Chattels, or Damage for them, or for Wrong done to his Person.

ACTION *Popular*, is an Action upon the Breach of some Penal Statute, which any Man that will may sue for himself and the King, by Information or otherwise.

ACTIONS *Real*, are Actions whereby the Plaintiff claims Title to Lands, Tenements, Rents or Commons, in Fee, or for Term of Life.

ACTIVE PRINCIPLES, according to the Chymists, are the Spirit, Oyl and Salt, because their Parts being briskly in Motion do cause Action in other Bodies.

ACTUARY, the Clerk that Registers the Acts and Constitutions of a Convocation.

ACUTE ANGLES: See *Angles*.

ACUTE ANGLED Triangle: See *Triangle*.

ACUTE DISEASE, is that which is over in a little time, but not without eminent Danger to the Patient.

ACUTE ACCENT, in Grammar, shews when the Voice is to be raised, and is expressed thus, (').

ACUTE *Angular Section of a Cone*, was the Term that the ancient Geometers used for the *Ellipsis*; but *Apollonius Pergæus* first demonstrated, that the Section of any Cone thro' both it Sides, will produce the same Figure; whereas they consider'd it only in that Cone whose Section by the Exis is a Triangle acute angled at the Vertex.

ADARIGE, with some Chymists signifies *Sal Armoniack*.

ADDITAMENTS, Things added a-new to the ordinary Ingredients of any Composition; or to a *Menstruum*, to enable it the better to open, and dissolve any Body.

ADDITION, in general, is the putting of two Things or Quantities together; and that Quantity which arises or results from thence, is call'd the Sum or Aggregate of those Quantities.

ADDITION in *Algebra* or *Species*, is performed in general, by conjoyning the Quantities proposed, preserving their proper Signs. And the proper Mark or Sign of Addition is +, which is always supposed to belong to the Quantity which follows it.

Thus, if to $3a$ the Sum is $3a + 2a$ or $5a$, and you add $2a$ } $A + 2b$ when added to $c + bb$ makes $A + C + 2b + bb$

Addition in *Algebra* may easily be learnt by observing the following particular Rules.

1. When *Simple* and *Like* Integers, having *Like* Signs are to be added, collect the Numbers (or Coefficients) all into one Sum, and to that Sum an-

nex the Letters by which any of the Quantities was express'd; and lastly, prefix the proper Sign;

$$\begin{array}{r} \text{Thus, } -b \\ -2b \text{ and } +bcd \\ \text{make } -13b \quad +2bcd \\ \quad +4bcd \text{ and } -36de \\ \text{make } +7bcd \quad -4de \\ \quad \text{make } -40de. \end{array}$$

2. *Rule*. When two simple and like Quantities have equal Numbers prefix'd, and unlike Signs, the Sum is 0;

$$\begin{array}{r} \text{Thus, } +3a \text{ and } -bb \text{ and } -7dce \\ -3a \quad +bb \quad +7dce \\ \hline 00 \quad 00 \quad 00 \end{array}$$

N. B. The Reason of which is plain, if you consider that all Quantities having Negative Signs, are in Nature directly contrary to such as have Affirmative ones; and therefore will always destroy one another. Thus, if a Man have 10 Pounds in Cash, and run in Debt 13 l. that is, if to his Cash he add 10 l. (which is the proper way to express a Debt) there will remain nothing; for the Debt, or -10 l. will quite destroy the Cash, or +10 l. So also if a Man owe 10 l. and having nothing to pay it, then hath he a -10 l. or is 10 l. worse than nothing: And if any Person give him 10 l. or add a +10 l. to his -10 l. the Sum will be nothing, but however the Man will, tho' worth nothing, be 10 l. better than he was before.

So that 'tis a general Rule in *Algebra*, that to add - is the same as to take away +, and to take away - is the same thing as to add +, and to take away + is all one as to add -.

3. *Rule*. When two simple and like Quantities are given, having unlike Signs, and unequal Numbers prefix'd; subtract the lesser Number from the greater, and to the Remainder annex the Letters due, prefixing the Sign that belongs to the greater Quantity,

$$\begin{array}{r} \text{Thus, } +3a \text{ and } -8b \\ -a \quad +2b \\ \hline +2a \quad -6b \end{array}$$

The Reason of which is clear from what was said in the last Rule.

4. *Rule*. When three or more simple and like Quantities have unlike Signs, collect the Affirmative Quantities into one Sum, the Negative into another, then (by the 3d Rule) add these together, and the last Sum is the Sum sought;

$$\begin{array}{r} \text{Thus, } -7a \quad -10a \\ -3a \\ +5a \quad +14a \\ +9a \\ \hline +4a \text{ Sum.} \end{array}$$

5. *Rule*. When two or more simple and unlike Quantities are proposed, write them down one after another without altering their Signs;

$$\begin{array}{r} \text{Thus, } +3a \\ -3b \\ \hline +3a + 4b \end{array}$$

From the due Apprehension of, and mature Consideration on which Rules, the Addition of Compound Quantities may be easily perform'd;

$$\begin{array}{r} \text{Thus, } +3ee+7bb \\ \quad \quad \quad -ee-2bb \\ \quad \quad \quad +ff+3ff \\ \hline \text{Sum } 3ee+7bb-ee-2bb+ff+3ff \\ \hline \text{Contracted } +2ee+5bb+4ff \end{array}$$

ADDITION of *Indexes* is performed after the same manner with that of Algebraical Quantities.

Thus, to 3 add 3, the Sum is 6, where both are the *Indexes* of Integer Numbers: But to 3 add $\frac{1}{2}$ the Sum will be 1: To $\frac{1}{3}$ add 3, the Sum will be $\frac{1}{3}$, &c.

ADDITION of *Integers*, in Common Arithmetic, is performed by this single Rule:

Set the Numbers orderly one under another, *i.e.* Units under Units, Tens under Tens, Hundreds under Hundreds, &c.

Then collect each Column singly into one Sum, beginning at the Right Hand, at the place of Units; and if the Units in that Row are less than 10, set them down under the Line, but if they are more than 10, set down only the Overplus, and carry the Tens to the next Row, in which set down (under the Line) the odd Tens, and carry the Hundreds to the third Column, &c. as you will see in the following Examples.

16	34	756	5789	93256
72	68	382	3452	13700
		568	7898	78250
88	102		3257	97662
		1706		15628
			20396	
			297496	

But if the Numbers be of different, or of several Denominations, then they must be added by summing up each Denomination by it self, and seeing how many of them will make one of the next Denomination; and bearing so many Units forwards as those will come to.

Thus, suppose the following Pounds, Shillings and Pence were to be collected into one Sum.

l.	s.	d.	
135	17	08	say 9 and 2 are 11, and 8 makes
95	11	02	19, which because it is 7 above
3	05	09	12, or a Shilling, I set down
234	14	07	the odd Seven Pence, and carry

one Shilling to the next Rank. Say 1 that I carry and 5 is 6, and one is 7, and 7 is 14; I set down 4, and I find I have in all 3 Tens, therefore I set down one Ten on the Left Hand of the 4, and carry one Pound to the Column of Pounds; where I proceed, just as in Addition of *Integers*, and find the whole Sum to be 234*l.* 14*s.* 07*d.*

ADDITION of *Logarithms*: See *Logarithms*, N^o 3.

ADDITION of *Vulgar Fractions*: See *Vulgar Fractions*.

ADDITION of *Decimal Fractions*: See *Decimal Fractions*.

ADDITION in *Law*, is that which is given to a Man besides his proper Name and Surname, to shew of what Estate, Degree or Mystery he is, the place of his Birth or Habitation.

ADDUCENT MUSCLES, are those that bring forward, close, or draw together the Parts of the Body whereunto they are annexed.

ADDUCTORES, the same with *Adducent Muscles*.

ADDUCTOR OCULI, is a Muscle of the Eye, so call'd, because it inclines its *Pupil* towards the

Nose; and also *Bibitorius*, it directing the Eye towards the Cup in drinking.

ADDUCTOR POLLICIS, is a Muscle of the Thumb, which arises tendinous in common with the *Adductor Indicis*, and becoming fleshy, ascends obliquely to its broad Termination at the superior part of the first Bone of the Thumb. This brings the Thumb nearer the Fore-Finger.

ADDUCTOR POLLICIS PEDIS, is a Muscle of the Great-Toe, which ariseth partly tendinous and partly fleshy from the Inferior Parts of the *Os Cuneiforme Tertium*, and dilating its self to a fleshy Belly, marcheth obliquely in the bottom of the Foot, and becomes less and tendinous as its Insertion to the Internal Part of the *Offa Sessamoidea* of the Great-Toe, laterally opposite to the Termination of the *Adductor Pollicis Pedis*. This brings the Great-Toe nearer the rest.

ADEN, is the Term for a Glandule in an Animal Body, which is either *Conglobated*, as the Glands of the *Mesentary*, &c. With some also 'tis used for a Tumour in the Groin, the same with *Bubo*.

ADEPS or Pinguedo, *Fat*, is a similiar Part of the Body: But *Adeps* and *Pinguedo* differ in this, that *Adeps* is a thicker, harder, and more earthy Substance than *Pinguedo*; the *Fat* which is particularly meant by *Adeps* flows from the Blood thro' peculiar Vessels into Bags or Bladders appropriate thereunto, as is plain from the Observation of *Malpighius*.

ADEPTISTS, or *Adepts*, are such Alchymists as pretend to have gain'd the Secret of the *Transmutation* of Metals, or to make the *Philosopher's Stone*: Of these Mystical Invisible Gentlemen (they say) there are 12 always in being; which are kept supply'd by new ones when any of the Fraternity pleaseth to die, or to translate himself to some place where he can make use of his Gold, for in this wicked World it will not procure them Shirts.

ADEQUATE; a thing is said to be adequate to, or adequately to agree with another, when 'tis every way equal to it in Extent, Capacity, Power, &c. and all other Properties; and neither exceeds it, nor falls short of it in any respect. And thus when the Notions or Ideas that we have of any thing, take in all the Properties of that thing, and that we omit conceiving nothing which belongs to it, we then say we have *Adequate Ideas* of such things.

ADEQUATE IDEAS, are those Ideas which perfectly represent the Archetypes or Images which the Mind supposes them to be taken from; which it intends them to stand for, and to which it refers them.

ADJACENT or Contiguous Angles, see *Angles*.

ADIAPHORUS, or *Neural*, *i.e.* indifferent; So Mr. Boyle calls a kind of Spirit which he distilled from Tartar and some other Vegetable Bodies; which was neither *Acid*, *Vinous*, nor *Urinous*. 'Tis made thus; First, Shavings of Box, Guajacum, or any other ponderous Wood are distilled *per se* in a Retort; and then the fowrth Liquor is rectified to free it from the Phlegm: After this a Quantity of Powder of Coral, &c. was thrown into the fowr Spirit, which it readily dissolved; and the Acid Parts of the Menstruum did so associate themselves with the Coral, as to leave a part of Liquor that was by no means of an Acid Nature, but which when gently drawn off the Coral, was of a strong Snell, yet without any Acidity, and in many respects of a different Nature from almost any other common Spirit.

AD-

ADJECTIVES (in Grammar) are such Words as describe the manner only of the Being of a thing, and have no natural subsistence of their own, but do subsist by *Noun Substantives*, to which they are joyned.

AD INQUIRENDUM, a Writ in Law commanding an Enquiry to be made (for the better Execution of Justice) about the Merits of a Cause depending in the King's Court.

ADJOINING ANGLES, in Geometry: See *Angles*, or *Contiguous*.

ADJOURNMENT, is the putting off of any Court or Meeting, and appointing it to be kept at another Place or Time.

ADIPOSA MEMBRANA, is the Basis of the *Cellule Adiposæ*, is double, and may be divided into two Parts; the one is External throughout which there are a number of little Cells, full of Fat; the other is Internal, which Anatomists have mistaken for the *Membrana Carnosa*, because it has a greater Number of Blood Vessels.

ADIPOSA VENA, or *Renalis*, a Vein arising from the descending Trunk of the *Cava*; which spreads its self on the Coat, and Fat, that covers the Kidneys.

ADIPOSI DUCTUS, call'd also *Sacculi*, *Vesicule Adiposæ* or *Lobuli*, are Vessels which convey the Adeps or Fat into the Interstices of the Muscles, or to the Parts between the Flesh and the Skin.

ADIT, is the *Shaft*, or Entrance into any Mine.

ADJUDGE, when a determinate Sentence is pass'd in the behalf of another, the Case is said to be Adjudged for him.

ADJUNCT: Whatever comes to any Being from without, is called an *Adjunct* to that Being; as being not naturally and essentially belonging to it, but adjoyned or superadded to it.

AD JURA REGIS, is a Writ that lies for the King's Clerk against him that sought to eject him, to the Prejudice of the King's Title in Right of his Crown.

ADJUTANT, an Officer in the Army, the same with an *Aide-Major*, which see.

ADMEASUREMENT of Dower, is a Writ that lies where a Woman is endowed by an Infant, or by a Guardian, of more than she ought to have.

ADMEASUREMENT of Pasture, is a Writ that lies against such, as having Common of Pasture appendant to their Free-holds, do surcharge it with more Cattle than they ought to do.

ADMINISTRATION, (in Law) is the disposing of a Man's Goods or Estate that died intestate, or without any *Will*, with an Intent to give an Account thereof.

ADMINISTRATOR, he that has the Goods of a Man dying intestate, committed to his Charge by the Ordinary, and is accountable for the same. If the Person be a Woman, she is called an *Administratrix*.

ADMITTENDO CLERICO, is a Writ granted to him that hath recovered his Right of Presentation against the Bishop, in the *Common Bench*.

ADMITTENDO in Socium, is a Writ for the Association of certain Persons to Justices of Assize before appointed.

ADNATA TUNICA, is the common Membrane of the Eye, called *Conjunctive*, it springs from the Skull, grows to the Exterior Part of the *Tunica Cornea*; and that the visible Species may pass there, leaves a round Cavity forward, to

which is annexed another Tunic, without any particular Name, made up of the Tendons of those Muscles which move the Eye; by reason of its Whiteness, 'tis called *Albuginea*.

AD OCTO, among some of the Antient Philosophers, is a Term signifying the Highest or Superlative Degree; because they reckoned no Degree above the Eighth, in their way of distinguishing of Qualities.

ADONICK, a sort of a short Verse, consisting of a *Dactyle* and a *Spondee*; as *Rara juvenis*; 'tis usually placed at the end of each Stanza of Sapphick Verses. So called from *Adonis*, in whose Praise they were first made.

AD QUOD DAMNUM, is a Writ which ought to be sued before the King grant certain Liberties, as a Fair, Market, &c. to the Prejudice of others.

There is also another Writ of *Ad quod Damnum*, if any one will turn a Common High-way, and lay out another as beneficial.

ADAMIRE: See *Arraign*.

AD TERMINUM qui præterit, is a Writ of Entry that lies where a Man having leased Lands or Tenements for Life or Years, and after the Term expired, is held from them by the Tenant, or other Stranger that occupieth the same, and de facto the Lessor: In such Case this Writ lieth for the Lessor and his Heirs.

ADVANCE DITCH, in Fortification, is a Ditch dug all along the *Glacis* beyond the *Counter-scarp*, and usually filled with Water.

ADVANCE GUARD, is the first Line or Division of an Army, ranged or marching in Battarray; or that Part which is next to the Enemy, or which marches first towards them. The whole Body of an Army consists of the *Advance Guard*, the *Arriere Guard*, and the *Main Body*.

Sometime also a Party of 15 or 20 Horse commanded by a Lieutenant beyond, but within sight of the *Main Guard*, is called an *Advance Guard*, and is designed for the greater Security of the Camp.

ADVENT, in the Sacred Calender, is the Time from the *Sunday* that falls either upon St. Andrew's Day, or next to it, till *Christmas*; which Time was wont anciently to be spent in a pious Preparation for the Advent, or coming on of the Feast of our Saviour's Nativity.

ADVENTITIA BONA, were anciently such as came to a Man unexpectedly *Windfalls*, as we call them now: Hence the Word *Adventitious* comes to be used by Philosophick Writers, and to signify such Matter as doth not properly belong to any mix'd Body, but comes to it from some other Place. Thus, 'tis a Question, whether in the Freezing of Water, there do not enter in some *Frigorifick Particles*, which are *Adventitious* to the Water, from the Air, or Freezing Mixture.

AD VENTREM INSPICIENDUM, is a Writ mentioned in the Statute of *Essoignes*: See *Ventre Inspeciendo*.

ADVERB, in Grammar, is a Part of Speech undeclined, and without Conjugation; and is usually joyned with a Verb to express the manner of Action. They are distinguished into Adverbs of Time, Place, &c.

ADULTERATION of any Thing, such as Wine, Medicinal Drugs, Chymical Preparations, &c. is a mixing some baser Matter with it, which hinders it from being truly Good and Genuine in its kind.

ADVOCATES, in the Ecclesiastical Court, were either *Advocate* of the Causes and Interest of the Church, retain'd as a Counsellor and Pleader, to maintain the Properties and Rights: Or, *Advocate* or Patron of the Presentation and Advowson. Both these Offices did formerly belong to the same Founder of a Church or Covent, and his Heirs, who were bound to protect and defend the Church, as well as to nominate or present to it. But when the Patrons grew negligent, or were Men of no Interest or Ability in the Courts of Justice, then the Religious began to retain a *Law Advocate*, to sollicite and prosecute their Controversial Causes. See *Spelman*.

ADVOWSON, in our Common Law, signifies a Right to present a Benefice, and is as much as *Jus Patronatus* in the Canon Law; the Reason why 'tis termed Advowson (*Advocatio*) is, because anciently those who had a Right to present to a Church, were Maintainers of it, or great Benefactors to it: These were sometimes called *Patroni*, and sometimes *Advocati*. Now in the General, an Advowson is where a Bishop, Dean or Chapter, and their Successors, or any Lay Patron, have a Right to present whom they please, to any Spiritual Benefice, when it becomes void. *Advowson* is of two sorts; First, *Advowson in Gros*, that is, sole or principal, not belonging to any Mannor, as a Parcel of its Right: Secondly, *Advowson Appendant*, which depends upon a Mannor, as appurtenant to it; and this may be sold by it self, and then it is in *Gros*: And while it is dependant to the Mannor, 'tis by *Kitchen* called an *Incident*.

ADUST, burnt or parched; the Blood is said to be *Adust*, when by reason of extraordinary Heat, the thinner Parts are steem'd forth, and the thicker remain dreggy and black, as if they were burnt.

ÆGYLOPS, *Angilops* and *Ancylops*, is a Tumour or Swelling in the great Corner of the Eye by the Root of the Nose, either with or without an Inflammation.

ÆGYTIACUM, sc. *Unguentum*, in Pharmacy, is a kind of Deterfive Ointment, described by *Mesue*; and is so called from its black Colour, like the Hue of an Egyptian.

ÆNIGMA: See *Enigma*.

ÆOLIPILE, is a round hollow empty Ball made of Iron, Brass, Copper, &c. and furnished with a Neck, in which there is a very slender Pipe opening to the Ball. Sometimes the Neck is made to screw into the Ball, which is the best way, because then the Cavity may the more readily be filled with Water. But if there be no Screw, you must fill it with Water, thus; Heat the Ball red hot, and then throw it into a Vessel of Water; the Water will run in at the small Hole, and fill about $\frac{2}{3}$ of the Cavity. And if after this the *Æolipile* be laid on or before the Fire, so that the Water and Vessel become very much heated, the Vaporous Air will be forced out with very great Noise and Violence; but it will be by fits, and not with a constant and uniform Blast. Perhaps they may be sometimes of use to blow the Fire, where a very quick and strong Blast is required. And they may serve to scent or perfume a Room, by filling them with perfum'd instead of common Water.

ÆQUATOR: See *Equator*.

ÆQUILATERAL: See *Equilateral*.

ÆQUILIBRIUM, is when either equal Weights at equal Distances, or unequal ones at reciprocally proportionable Distances from the Centre, make the Arms of any Libra or Balance to hang even; so that they do Equiponderate and not out-weigh one another: In such a Case we say the Balance is in *Æquilibrio*.

ÆQUIVOCAL: See *Equivocal*.

ÆRA: *Lucilius* and some others say, that *Æra* did originally signify a Number stamp'd on Money to determine its current Value; and in this Sense it comes from *Æs* Brass, from the Plural of which *Æra*, came this feminine singular *Æra*; and that either because they put the Word *Æra* to each particular of an Account, as we now do *Item*: Or else because the Number of Years was anciently among the Romans mark'd down in Tables with little Brass Nails. In reference to which latter Custom, the Word *Æra* came to signify the same with *Epocha*, viz. a certain Time or Date from whence to begin the new Year; or some particular way of reckoning Time and Years. And in this Signification the Word is thought to rise from these Initial Letters, *A. E. R. A.* which, among the Spaniards, who began their *Æra* from the Reign of *Augustus*, stood for *Annus erat Regni Augusti*. The most eminent *Æra's* among Chronologers, are the *Æra* of the World's Creation, which, according to the Julian Account of Time, began in the Month of *October*, and on the 24th Day. Some place this 3950 Years before Christ's Birth, whom *Gassandus* saith, come nearest to Truth, and that this *Æra* is confirmed by the French Astronomers; others account 3983 Years before the Birth, of our Saviour, and with these *Petavius* joins. *Kepler* make them 3993; and there are some who will have it, that the true Number is 5199.

The Jewish *Æra* or Period, invented by *Hillel* about the Year of Christ 344. This is by no means Historical, but Artificial and Astronomical, and is suted to the Jews false Account of the New Moons, Feasts, Holydays, &c. and is of far later standing than the beginning of the World, tho' they use it as the Date of the Creation; it begins in *Autumn*.

The *Æra* from the Destruction of *Troy*, begins June 16. as *Scaliger* proves out of *Ephorus*: 'tis very common in Profane Authors.

The *Æra* of *Nabonassar*, begins the 26th of February (747 Years before Christ) but it varieth in 1461 Years thro' the whole 365 Days; for so many he accounts, neglecting the odd Hours, which makes a great Intercalation.

The *Æra* of the Olympicks begins from the New Moon in the Summer Solstice 777 Years before Christ, and the *Æra* of *Ipsitus* is only a Collection of the Olympick Years: These two are the *Æra's* chiefly used by Greek Historians.

The Roman *Æra*, from the building of the City, begins April 21. and is 752 Years before Christ.

The Christian *Æra* from the birth of Christ begins December 25.

The Turkish *Æra* or the *Hegira*, begins the 16th Day of July; they account it from *Mahomer's* Flight, A.D. 622.

The *Æra* of the Death of *Alexander the Great* is the 12th of November, 324 Years before Christ: See *Epocha*.

ÆSUSTUM, or calcin'd Copper is made by Stratifying Plates of Copper with Powder of Sulphur

phur in a Crucible, whose Cover or Lid hath a Hole in it to give the Vapours vent, while the Matter is calcining in a strong Fire, till no more Fumes will arise; the Plates must lie separated while hot. In this Stratification the first and last Beds or Layers must be of Sulphur.

ÆSCHYNOMENOUS PLANTS, the same as *Sensitive*, which see.

ÆSTIVAL SOLSTICE, or *Summer Solstice*: See *Solstice*.

ÆTATE PROBANDA, is a Writ of Office, and it lies for the Heir of the Tenant that held of the King in chief, to prove that he is of full Age, directed to the Sheriff to enquire of his Age; and then he shall become Tenant to the King by the same Services that his Ancestors made to the King.

ÆTHER: Dr. Hook *Microgr.* p. 13. calls the *Æther* that Medium or Fluid Body in which all other Bodies do as it were swim and move. But this seems to me to favour the *Cartesian Doctrine* of an Absolute *Plenum*, which, by many infallible Reasons and Experiments, is proved to be impossible. As therefore we call the Medium in which we breath and live, the Air, by which we understand an Elastic Fluid Body, either having its very large Interstices devoid of all Matter, or else filled in part with a Fluid, which is very easily moved out of them by Compression, and which readily returns into them again, when that Compression is taken off: So we agree to call that finer Fluid-Body, if it be a Body, which is extended round our Air and Atmosphere, above it and beyond it, up to the Planets, or to an indefinite Distance; this, I say, we call the *Æther*, tho' what we mean by that Word, we scarce well understand. For that there can be no Fluid whose Parts do resist the Motions of Bodies thro' them (as our Air doth) in the Planetary Regions, we are certain almost to a Demonstration; because the Motion of the Heavenly Bodies is by no means impeded or altered by any such Resistance, but they move as freely as if they were in an absolute Void. But that which is often meant by the Word *Æther* or *Æthereal Matter*, is a very fine thin Diaphanous Fluid, which some will have to surround the Earth up to as far as the Interstellar World, and which easily penetrates and runs thro' all things, and lets all things run as easily thro' it.

ÆTHIOPS MINERAL, is a Medicine usually made by incorporating well together equal Parts of running Mercury and Flower of Sulphur, and then deflagrating the Mixture.

But 'tis much the best way only to mix them well together in a Glass Mortar, and never to enkindle the Matter at all; the Mercury will perfectly disappear, and the Powder in a little time will turn black.

ÆTIOLOGY, signifies an Account of the Causes and Reasons of Diseases, and of their various Symptoms, in order to their Cure: Wherefore it is by some called *Parthology*.

AFFEERORS, a Term in Law, signifies such as are appointed in Court-leets, &c. upon Oath to mulct those who have committed any Fault which is arbitrarily punishable, and for which no express Penalty is prescribed by Statute.

To *Affere* an *Amercement*, is properly to lessen and mitigate the Rigour of it.

AFFIANCE (in Law) is the plighting of Troth between a Man and a Woman, upon an Agreement of Marriage to be had between them.

AFFIDAVIT, in Law, signifies an Oath: As to make *Affidavit*, is to testify a thing upon Oath.

AFFORCIAMENT, a Fortref or strong Hold, or other Fortification.

AFFOREST, (a Term in the *Forest Law*) signifies to lay waste a Piece of Ground, and turn it into *Forest*.

AFFRAY, or *Affraiment*, in the Common-Law, is an Affrightment put upon one or more Persons; and this may be wrought, they say, without a Word spoken or Blow given: As if a Man should shew himself in Armour, or furnished with Weapons not usually worn, it may strike a Fear into others that are unarmed; which therefore is a common Wrong, and is inquirable in a *Courts-leet*, wherein it differs from an *Affault*, which is always a *Particular Injury*.

AFFRETAMENTUM, the Freight of a Ship from the *French Fret*, which signifies the Tuns.

AFTER-SAILS, in a Ship: See *Sails*.

AGE PRIER (a Term in Common-Law) is when an Action is brought in against an Infant for Land which he hath by descent, for then he is to shew the Matter to the Court, and shall pray that the Action may be stay'd till his full Age of 21 Years, and so by Award of the Court, the Suit shall surcease.

AGENT and PATIENT (in Common-Law) is, when a Man is the Doer of a thing, and the Party to whom it is done; as where a Woman endows her self of the fairest Possession of her Husband.

AGGREGATE, is much the same as the *Sum*, arising from the Addition, Connexion or Collection of several things together.

AGGRESSES, or *Ogresses*, the same with *Pellets*. A Term in Heraldry: See *Balls*.

AGGRESSOR, is he that makes the first Assault, Attack, or that first begins any Quarrel, Encounter or Difference.

AGILD, in Law, signifies free from Penalty, not subject to the customary Fine or Imposition.

AGIST (a Term in Law) signifies to take in, and feed the Cattle of Strangers in the King's Forest, and to gather Money due for the same to the King's use. The Officers doing it are called,

AGISTERS; and their Office is called,

AGISTMENT.

AGITATION, in general, signifies Motion or Action; but 'tis mostly used in a Philosophical Sense for the brisk Intestine Motion of the small Corpuscles of any Natural Body. Thus Fire or Heat agitates the small Particles of all Bodies, and puts them into a rapid Motion.

AGNATION, in the Civil Law, is the Term for that Line of Consanguinity which is between Males descended from the same Father; as *Cognation* is the Line of Parentage between Males and Females, both descended from the same Father. The Use of both these Words is derived from the old *Roman Law*.

AGRICULTURE, is the Art of Tilling, Manuring, and Cultivating the Earth, in order to render it fertile, and to make it bear Plants, Trees and Fruits.

AGRYPNIA, is a kind of *Coma Vigil*, a Watching or Dreaming Slumber, proceeding from some Disorder in the Brain.

AGRYPNOCOMA, the same with *Coma Vigil*.

AIDE DE CAMP, in an Army, is an Officer always following one of the Generals, i. e. the General, Lieutenant General, or Major General, to receive and carry their Orders as Occasion requires. When the King is in the Field, he usually appoints young Gentlemen of Note to carry his Orders, and they are called, the *King's Aides de Camp*.

AIDE MAJOR, or *Adjutant*, is an Officer whose Business it is to ease the Major of part of his Duty, and to perform it all in his Absence. Some Majors have several *Aides Majors*; each Troop of Guards hath but one Major, who hath two *Aides Majors* under him, according to the greatness of the Business: Every Regiment of Foot hath as many *Aides Majors* as it contains Battalions. When the Battalion is drawn up, the *Aide Major's* Post is on the Left beyond all the Captains, and behind the Lieutenant Colonel.

AILE, is a Writ which lies where Land descends from the Grandfather to the Son or Daughter of his Son, the Father being dead before the entry by him, and one abates, the Heir shall have this Writ against the Abator.

AMIABLE NUMBERS; Mr. *Ozanam* calls such as are mutually equal to the whole Sum of one another's Aliquot Parts: As are these two Numbers 284 and 220. For 284 is equal to the Sum of all the Aliquot Parts of the second Number 220, which are 1, 2, 4, 5, 10, 11, 20, 22, 44, 55, 110. and the latter Number 220 is equal to all the Aliquot Parts of 284, viz. 1, 2, 4, 71, 142.

AIR. The *Atmospherical Air* in which we breathe is a Diaphanous, Compressible and Dilatable Fluid Body, covering the Earth and Sea to a great Height above the highest Mountains; and differs from the *Æther* (among other things) in this, that it refracts the Rays of the Moon and other remote Luminaries. This Air seems to consist of three differing Kinds of *Corpuscles*, or small Bodies.

1. Such as are carried up into it in the Form of *Exhalations* or *Vapours* from the Earth, Sea, and all Animal, Vegetable and Mineral Bodies, by means of the Sun's, or the Subterranean Heat.

2. There are yet a more subtle sort of Particles in the Air, which we may reckon emitted into it from the Heavenly Bodies; and also the Magnetic Streams of this Globe of Earth and Water.

3. There is also a Third kind of Particles, which perhaps do most properly merit the Name of *Aeræal*, as being the proper and distinguishing Parts of Air taken in the strictest Sense; and these are *Corpuscles* which are constantly *Elastical* or *Springy*. For *Elasticity* is an Essential Property of Air, and 'tis thought no other Fluid hath any thing of it, but only so far as it participates of Air, or hath Air contained in its Pores. So that our Air probably doth either consist of, or abound with Parts of such a Nature, that in case they be bent or compressed by the Weight of the incumbent part of the Atmosphere, or of any other Body, they do endeavour to free themselves from that pressure, by bearing against the Bodies that kept them bent; and as soon as these Bodies are removed to give them way, they unbend themselves, either quite, or so far forth as the Bodies that resist them will permit, and thereby expand the whole parcel of Air, these *Elastical Bodies* compose.

Dr. *Hook*, in his *Micrograph*. p. 13. seems to think the Air to be nothing else but a kind of Tin-

ture or Solution of Terrestrial and Aqueous Particles dissolved in, and agitated by the *Æther*; and these Particles he supposes to be of a saline Nature.

Mr. *Boyle* found, that one and the same Portion of Air, may make up 52000 times the Space it doth at another time. See *Traits about the admirable Rarefaction of the Air*. And in the said Discourse he tells us, That he found by undoubted Experiments, that the same Quantity of Air, by only having the Pressure of the Atmosphere taken off in the Pneumatick Engine, and without any Adventitious Heat to encrease its Spring, would possess above 13000 times its natural Space or Dimensions.

Dr. *Gregory* in his *Astron.* p. 401. shews, that if Air expand it self according to Mr. *Boyle's* observed Law, viz. That the Spaces into which it may be compressed, are always reciprocally proportional to the compressing Weight: Then a Globe of Air of the Diameter of one Inch, if rarefied so, as (according to that Rule) it must be at the Distance of the Earth's Semi-diameter (from the Earth) will fill the Planetary Regions as far as, and much beyond the Sphere of *Saturn*.

And the great Dilatation and Compression of Air may be easily enough conceived, without the Intervention of any subtle Matter, if we imagine each proper elastick Particle of Air to be like a little Spring of a Watch coiled up round, or wound up like a Piece of Ribband: For, if you allow further, that these Particles have also a Circular Motion round their own Axis, the Parts of each Roll, Coil, or *Lamina* will endeavour to recede from the Axis of its Motion, and this more or less, according to the Velocity of their Motion; by which means they will acquire a Springiness outward like a Watch Spring, and will endeavour to fly or unwind themselves out to their full length, but that they are hindered by other such Particles on every side: And therefore these *Elastick Particles* in the lower Parts of the Atmosphere, will always be kept bent or wound up, by the weight of the whole of the Air; but if at any time they can get rid of this Weight and external Pressure, they will readily, by their natural Spring, evolve themselves, and extend their Roll, or Circles to vastly large Dimensions. And this may be the Reason of the Tumescence of a Bladder not apparently blown out, in the exhausted Receiver; of a full-blown one (if dry) breaking there, and of the breaking of square figured Vials, when stop'd well, and the Air thoroughly drawn off from them.

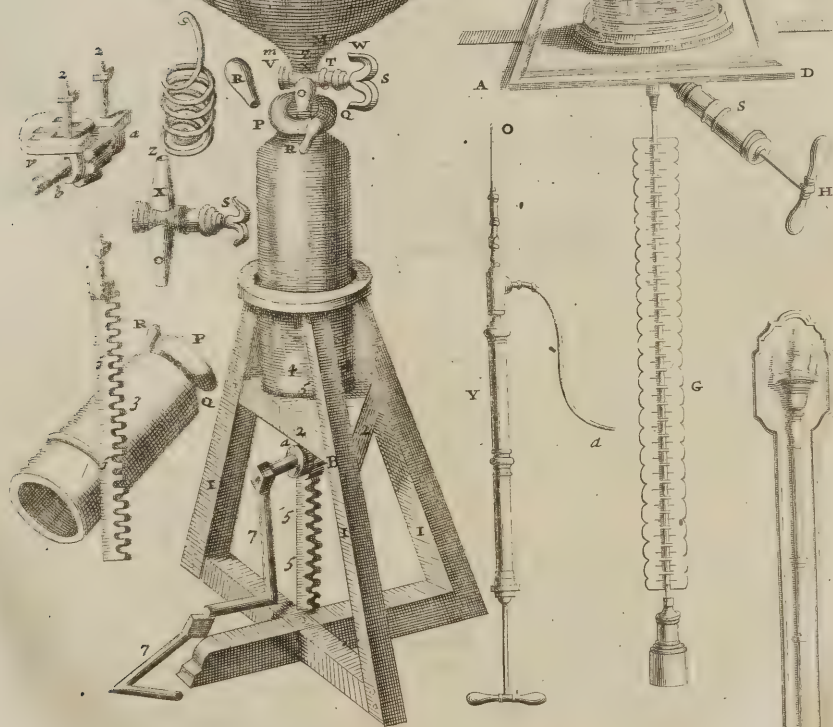
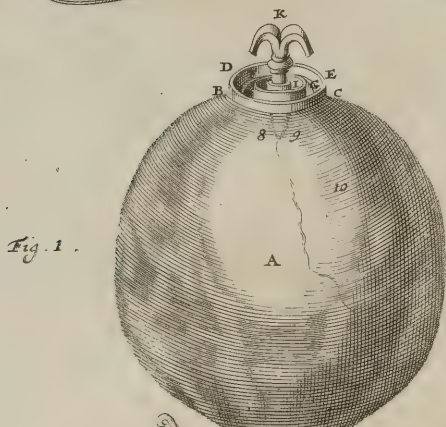
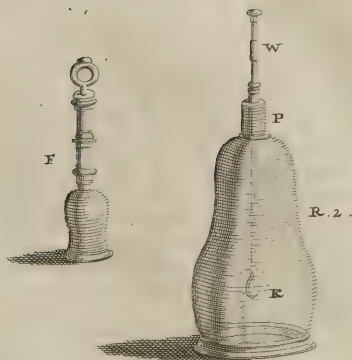
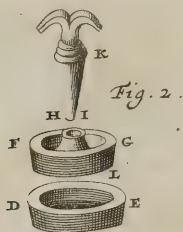
And 'tis equally easy to conceive, that a great Dilatation or Rarefaction of Air may be produced by Heat; for the Rapid Motion of the Calorick Particles must needs so move the Aeræal ones, and by that means may make them more endeavour to recede from the Axis of their Motion, and consequently more unwind or unroll themselves; wherefore they must take up more Space, and must more thrust, by this encreased Spring, all other Bodies from them, and separate themselves from one another.

Mr. *Boyle*, in his Discourse against *Linus*, shews, that the Strength required to compress Air, are in Reciprocal Proportion (nearly) to the Spaces comprehending the same Portion of Air.

AIRS WEIGHT. The Weight of the Air was first discovered by the great *Gallileus*; who finding that Water by pumping could be raised no higher than 34 or 35 Feet, concluded, that the Notion of



Place this under Air Pumps.



M^r Hawksbee's Barometer, rising & falling 60 Inches



an infinite *fuga vacui* would not do in this Case; and therefore happily fell on thinking of the Counter-Balance of the Air's Weight, which *Torricellius* afterwards pursued and improved, with like Sagacity; inventing, as a farther Proof of the Notion of the Gravity of the Air, that which we call the *Torricellian Experiment*.

Mr. Boyle found a Lamb's Bladder containing about $\frac{3}{4}$ of a Pint, and blown up; and well dried to lose about a Grain and $\frac{1}{2}$ when it was prick'd, and the Air let out.

Also, that a Lamb's Bladder being counterpoised in a nice Pair of Scales in the Receiver, on the Air's being drawn out, did manifestly preponderate; but when the External Air was let in again, the Scale's returned to their former Equilibrium.

An *Æolopile* well heated, and then having its little Hole stopp'd, was cooled, and weighed; after which the Hole being opened, the Air was heard plainly to rush in with a whistling Noise, and then the *Æolopile* being weigh'd again, it was manifestly heavier than it was before.

The *Magdeburgick Engine* being weighed when full of Air, and afterwards being again weighed when 'twas well exhausted, was found to weigh an entire Ounce and $\frac{1}{2}$ less than it did before.

And Mr. Boyle found by accurate Experiments, that a small Receiver weigh'd 33 Grains more when full of Air, than after it was exhausted. He found also that

A Glass Bubble as big as a Hen's Egg, having as much Air as could be driven out by Heat, had then its Stem nimble sealed up, and then being left leisurely to cool (for there is great Danger of its breaking) was put into a nice Balance, and then the Scales were equipoized: After, the sealed End being warily broken off, the Air was heard to rush in with a whistling Noise, and then the Scale in which the Bubble was, did manifestly preponderate by near $\frac{1}{2}$ of a Grain. And after this, filling it with Water, it was found to hold 906 Grains of that Liquor; so that allowing for $\frac{1}{2}$ of the Cavity of the Bubble's being filled with Air, which perhaps might weigh about a Grain, the Proportion of Water to Air appears in Weight to be about 905 to one, and roundly it may be supposed as 1000 to one, because 'tis not possible but that some Air must remain in the Bubble more than is now accounted for.

Mr. Boyle found by repeated Experiments, that the weight of Air to Water is as 1000 to 1.

Mr. Halley, in *Philos. Trans.* N^o. 181. says, That the Specific Gravity of Air, near the Earth's Surface to that of Water, at several Trials, was as 1 to 840, as 1 to 852, and as 1 to 860; the Mercury standing at all those times about 29 $\frac{1}{2}$; but because 'twas Summer Weather, and consequently the Air rarefied when all these were try'd, it may, without sensible Error in round Numbers, be said, that the Barometer standing at 30 Inches, and in a mean Estate of Heat and Cold, the Specific Gravity of the Air to Water, is as 1 to 800: Wherefore, since Mercury to Water is as 13 $\frac{1}{2}$ to 1, Mercury will be to Air as 10800 to 1, and a Cylinder of Air of 10800 Inches, or 900 Feet, is equal to an Inch of Mercury; wherefore if the Air were throughout of an equal Density, the Height of the Atmosphere would be no more than 5 Miles, and one Tenth of a Mile, and in the Ascent of every 900 Feet from the Earth's Surface, the Mercury in the Barometer would fall an Inch. But since the

Expansion of Air increases, as the Weight of the incumbent Atmosphere decreases, or as the Mercury sinks in the Barometer; the upper Parts of the Air must be much more rarefied than the lower, and consequently the Height of the Atmosphere much greater than 5 Miles. See Vol. 2.

AIR PUMP, an Instrument to exhaust the Air out of proper Vessels. Mr. Boyle owns he had the first hint of it from *Seboterus*, who had published to the World, (but Mr. Boyle had not seen the Book) that one *Otto Gerick*, Consul of *Magdeburgh*, had found out a way of evacuating Glass Vessels, by sucking out the Air at the Mouth of the Vessel, plunged under Water. But this Engine was defective in two respects: 1. That in order to evacuate the Vessel, there was required the continual Labour of two strong Men for two Hours. 2. The Receiver and Engine being all of one Piece, there was no way to get things in and out of it, in order to try any Experiment upon them. To remedy which, and to supply those Imperfections which Mr. Boyle had heard the *Otto Gerick Engine* laboured under, he directed one Mr. G. and Dr. Hook to contrive a newer and better Air Pump; which Dr. Hook effected in the following Form, which I will describe, because it was the first of the kind made here.

This Air Pump consists of two Parts; a Glass Vessel; and a Pump to draw the Air out of it.

The Glass is expressed by the Fig. 1. *A* having a Hole at the Top with a Cover fitted to it, and also a stop Cock fastened to the Extremity of its Neck below; its Cavity being large enough to contain about 60 lb. of Water. The Diameter (*B C*) of the Hole at the Top of the Vessel (*A*) is about four Inches, the Orifice whereof is encompassed with a Lip of about an Inch in Height, whose use is for the Cover to rest on; which Cover is described in the Second Figure, where (*D E*) denotes a Brazen Ring, which is to cover, and to be closely cemented on the Lip (*B C*) of the first Figure. To the internal tapering Orifice of this Ring, is fitted a Brafs Stopple (*F G*), so exact, as to prevent any considerable access of External Air: In the midst of this Cover there is a Hole (*H I*) of about half an Inch Diameter, encompass'd with a Ring or Socket of Brafs, to which is likewise fitted a Stopple (*K*) of the same Metal, so exquisitely adapted to it, that it may be turned round, without admitting in the least Air, and yet may be put in or taken out at pleasure: Through the lower End of it there is a little Hole (*8*) made for Passage of a String, (*8, 9, 10*) which is likewise to pass through a small Brazen Ring (*L*) fixed to the Bottom of the Stopple (*F G*); the use of which String is to move what is contained in the exhausted Vessel, without unstopping it. That the Stop Cock (*S*) (in the first Figure) might be better fastened to the Neck of the Receiver, and cemented on with Pitch, Rosin and Wood-ashes well incorporated together, and poured hot into the Cavity of the Plate; and to prevent the Cement from running into the Orifice (*Z*) of the Shank (*X*) it was stopp'd with a Cork, having a String fixed to it, that it might be drawn out at the upper Orifice of the Receiver, and then the Glass Neck of the Receiver being well warmed, and thrust into the Cement, it filled the Interstices betwixt the Tin Plate and the Receiver, as also between the internal Superficies of the Receiver, and the Shank of the Cock.

The lower Part is the *Sucking Pump* or *Air Pump*, supported by a Frame of Wood, with three Legs, (III) so contrived, for the free Motion of the Hand, that one side of it may stand perpendicular; across the Midd of the Frame is nailed a Board (222) to which the Pump is fastened.

The Pump is made up of four Parts, viz. An exact and strong Cylinder of Brass of about fourteen Inches in length, with a Cavity of about three Inches Diameter; to which is fixed a Sucker made up of two Parts; the one (44) somewhat less in Diameter than the Cavity of the Cylinder, on which a thick Piece of tann'd Leather is nailed, whereby it closes so exactly to the Cylinder, that the Air cannot insinuate it self between them: The other Part being a thick and narrow Plate of Iron (55) is firmly joined to the Middle of the former Part (44) it is somewhat longer than the Cylinder; one Edge of it being smooth, but the other indented (as in the Figure) with a Row of Teeth; to the Interfices of which are fitted the Teeth of a small Iron Nut (LB) which is fastened by two Staples (22) to the under side of the cross Board (222) on which the Cylinder rests, and is turned to and fro by the *Manubrium* or Handle (7).

The last part of the Pump is the Valve (R) being a Hole at the Top of the Cylinder, a little taper towards the Cavity; to this Hole is fitted a Brass Pegg, to be put in or taken out upon Occasion.

Having thus described the Engine, it will be requisite for the better Exclusion of the outward Air, and the more easy moving of the Sucker, Stop-cock and Key S, as also the Valve, that they should be well oyled with Sallad Oyl; but sometimes Oyl and Water together prove more effectual: Also, that the Ingress of Air betwixt the Brass Cover and the Ring may be likewise prevented, the Edges of both must with the former Cement, be carefully plaistered, and spread on with a hot Iron, that it may run the better, and fill the little Cavities.

Things being thus fitted, and the lower Shank (O) of the Stop-cock being put into the upper Orifice of the Cylinder, then the Handle being turned till the Sucker rises to the Top of it, and shutting the Valve with the Plug, and turning the other way, the Sucker is drawn down to the Bottom; by which means the Air is driven out of the Cylinder, and a Succession from without being prevented, the Cavity of the Cylinder must be emptied of Air; then if the Turn-cock be turned, so as to afford a Passage betwixt the Receiver and Cylinder, part of the Air contained in the Receiver, will descend into the Cylinder, and by turning back the Key, that may be prevented from flying back into the Receiver, and may also, by opening the Valve, and winding up the Sucker, be forced into the open Air; and so by reiterated Exfuctions of the Air out of the Receiver, and Expulsions of it again out of the Cylinder, it may be exhausted, as the Nature of the Experiment requires.

When this Engine is set on work, these *Phenomenas* are observ'd (1) That the Sucker being wound up, and upon stopping the Valve, and turning the Key, drawn down again; the Air in both Vessels will be brought to an equal Measure of Dilatation; and upon returning the Key, and opening the Valve, near a Cylinder full of Air will be expelled; but the Receiver by reiterated

Exfuctions, being more and more exhausted, less proportionably is forced out; so that at least, before you need to open the Valve, the Sucker may be forced up almost to the Top of the Cylinder; and if, when it is so exhausted, you let go the Pump, the Valve being stopped, the Sucker merely by the Protrusion of the External Air, overpowering that more rarified Air within, will be forced up to the Top of the Cylinder; whereby 'tis observ'd, That as the Sucker is press'd higher by the external Air, it shews the Receiver to be more or less exhausted; the Air in the Cylinder being accordingly more or less able to resist the external, as it varies in Quantity. 'Tis also observ'd, That whilst the Receiver retains any considerable Quantity of Air, there is a brisk Noise immediately produced upon the turning of the Key.

2. Also, that when the Receiver is well exhausted, the Brass Key (that is a Stopple to the Brass Cover) cannot be lifted up without some Difficulty, for it feels as if some great Weight were fastened to the Bottom of it: The Cause of this *Phenomenon* seems to be, That the Air in the Receiver being very much dilated, its Spring must be proportionably weakened, and consequently the lower end of the Stopple is accordingly press'd up, whereas the Spring of the external Air is not at all weakened; so that a Strength to lift up the Stopple, must support a Pressure equal to the Disproportion betwixt the Force of the internal expanded Air, and that of the *Atmosphere* incumbent upon the upper part of the Stopple: But if the Air be let into the Receiver by Degrees, the Weight that is supposed to keep the Stopple down, may be felt to decrease more and more, the internal Air by this Recruit approaching more to an *Æquilibrium* with the external, till at last the Receiver being fill'd with Air again, the Stopple may be easily lifted up.

Mr. Boyle, after some Years Experience, found it convenient to alter a little the Form of his first *Air Pump* into that which the annexed Figures represent: And the advantageous Differences between this and the former Engine, are as followeth.

(Vid. Plate I.)

1. The Cylinder is contrived to be placed within a Frame of Wood which is filled with Water, so that the Cylinder is always kept quite covered with it; by which means the Sucker is always kept Turgid and Plump, and the Water also fills up all the little Intervals or Spaces between the Sucker and the Barrel, and by that means the Air is much more exactly excluded than in the former Engine. But here great Care must be taken in turning the Stop-cock, or else the Water will get into the Receiver, and spoil the Experiment.

2. Because in this Engine the Sucker is to be always under Water. There is a Perforation *PQ* (See Plate II.) which passes perpendicularly thro' it, and together with the Stick *RS*, serves for a Valve, and is to be stop'd at the Bottom of the Cylinder *NO*, when it is full of Water; wherefore the Stick *RS* must be of a considerable Length, as of 2 or 3 Foot.

3. The chief thing in this reformed Engine is, that the Pipe *AB* (Plate II.) whose End *B* turns upwards, is made to lie in a Groove or Gutter hollowed purposely for it in the Board *CDEF*, on which the Receivers are to rest. This Board was covered

covered with good Cement, and then on it was applied a strong Plate of Iron of the bigness of the Board, having only a Hole in the Middle for the Mouth of the Pipe *B* to pass through; and this Plate he added, because he found that the Weight of the Atmosphere would sometimes force the Air to penetrate thro' a thick Board, tho' its Pores were also designedly filled with Oyl. The Edges of this Plate should be a little turned upward, to hold a little Water, which now and then will be apt to get into the Receiver.

The Stop-cock, *GHIK*, tho' it may be soldered into the Cylinder at *I*, yet had better go on with a Screw; for then it may be more easily mended if it should not prove right or stanch, and also will not be so apt to break off. 'Tis convenient also to have a little Cover of Tin, &c. to put over the Nose of the Pipe *B*, to hinder things from falling into it, or injuring it, and to keep the Cement out of it, when very small Receivers are used.

There is this considerable Advantage in this flat Board on which the Receiver is placed; that the Receiver needs no Stop-cock of its own, but is usually one entire piece of Glass in the form of a Bell, or Cucurbit, &c. which will much better keep out the Air than if it were perforated, tho' the Stop-cock should be never so good.

Care must be taken to get a good Cement to fasten the Receivers to the Plate: That which the Honourable Mr. Boyle used was a well wrought mixture of equal parts of Bees-wax and Turpentine; tho' in the Winter he found it best to use a little more of the Turpentine, and in the Summer a greater portion of Bees-wax.

The Description of Mr. Papin's Engine for exhausting the Air from Mr. Boyle's continuation of the *Physico Mechanical Experiments*, Part 2. *Iconismus primus*, Figure 1, 2.

AA, are two Pumps made of Brafs.

BB, are two Pluggs hollow within and open below:

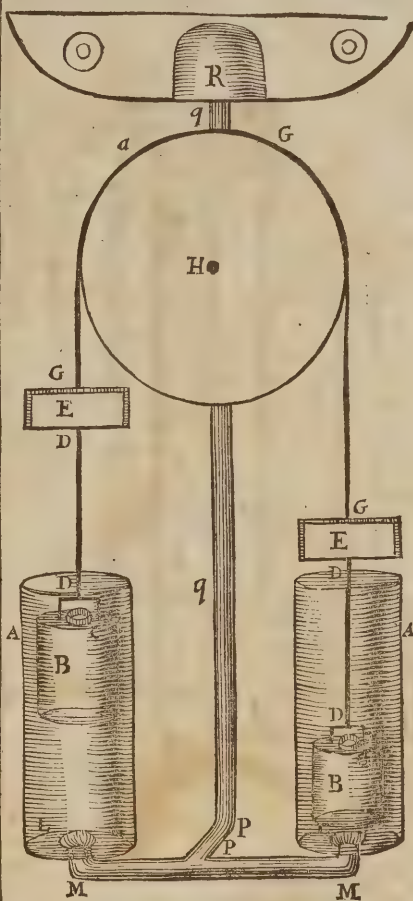
CC, are two Holes in the upper part of the Pluggs, with Valves opening inwardly, that they may afford passage to the Air to go out, and hinder it from coming in.

DDDD, are Iron Rods serving to move the Pluggs, and annexed to them, by means of the Gnomons *FF*.

EE, are two flat Iron Stirrups at the top of the Rods *DD*, on which the Operator must stand to set a-work the Engine.

GGG, is a Cord joyned to the two Stirrups, and compassing the Pulley *H*.

LL, are two Valves at the Bottom of the Pumps, opening inwardly, for the admission of the Air out of the Tube *MM*.



MM, is a Tube reaching from both Pumps to the Plate *OO*, by means of the Curvature *PP QQ*; which Curvature ought to be so long, that the Tube *PP QQ* may not hinder the Exerciser of the Pumps, but that he may conveniently stand on the Stirrups *EE*.

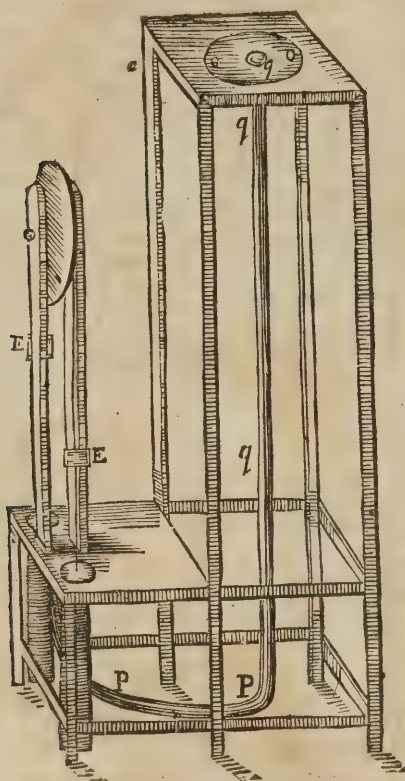
OO, is a Plate bored in the middle, on which the Receivers to be evacuated, are to be put; as *R* for Example.

This Engine is to be put into a Frame of Wood to support it before it can be used, such as is shewed in the second Scheme. And as much Water is to be pour'd into the Pumps thro' the Hole *Q* in the Plate *OO*, as is sufficient to fill the Cavities of the Pluggs, and a little more; and then some Body must stand on the two Iron Stirrups *EE*, and must alternately depress and elevate them: For by this means the Pluggs following the Motion of the Stirrups, in their ascent will leave the Space in the Bottom of the Pump empty; and seeing all other Passage is intercluded from the Air, that Air alone which is contained in the Receiver *R*, is conveyed into the afore said Pumps by the Tube *QQ PPM*, and opens the Valve *L*, which being shut again, hinders the same Air from making a Regress; wherefore the Plugg afterwards descending, compresseth that Air, whence, of necessity, the Valve *C* must be open'd, and all the Air must pass out of it,

D

because

because the Water in the Bottom of the Pumps doth exactly fill all the Spaces, and doth also regurgitate through the Valve G.



Here 'tis observable, That this *double Engine* is upon many Occasions to be preferr'd before a *single one* (that's mov'd with the Foot) for it doth not only produce a double Effect, but performs it much more easily; for in these Engines, which are furnished but with one Tube, whilst the Plugg is drawn out to evacuate the Pump, the whole Pillar of the Air, incumbent on the Plugg, is to be elevated by Force; and again, when the Plugg returns back, it is also by Force to be restrained, lest it should be too swiftly impell'd by the Air, and so break the Bottom of the Engine; but in these *double Engines*, the Plyer of them is in a manner wholly free from that Toil. For the Pluggs are easily lifted up, in the first Suction; because the Air, immediately derived from the Receiver R into the Pumps, presses the Pluggs downwards, almost as strongly as the external Air incumbent on the opposite Parts; and when the Quantity of the internal Air is diminish'd, it comes to pass, that the Plugg to be deprest'd, tends downward with so much the greater Force, and so by means of the Cord GGG compassing the Pulley, draws the other Plugg upwards, and at the same time hinders it from too much Velocity of Descent; so that by this means both Pluggs at one and the same time will be helpful to him that exerciseth the Pumps.

This Engine is of great use in order to those Experiments which cannot be very well made but

with Velocity and Speed, seeing the Pluggs make but a small Resistance, a Man may easily judge, that the two Pumps of this Engine may be plyed with greater Ease and more Speed, than one Pump in a single Engine can.

The Ingenious Mr. *Hawkesbee* now makes *Air Pumps* of a much simpler and easier Form than these Engines, above described, and in which are many Conveniences which they had not: The Form of which is as follows.

1. There is a square Board, as *ABCD*, which, by the Help of two Screws, is fastened readily in any Window, or on any Table; in the middle of this Board is a Hollow, which contains a Brass Plate, on which the Recipient R is placed, and fastened to it without any Cement, by means of a thin Piece of wet Leather: In this Brass Plate are two Holes, into one of which is an Elbow fitted, which hath the End of the *Air Pump* screw'd on it, and on that Screw is a Valve made by a piece of Bladder, and answers alternately to another in the Sucker, opening when that shuts, and closing when that opens reciprocally: The other Hole hath fastened into it a small Brass Pipe, on which is screw'd the upper Part of the Mercurial Gage, whose use is by the rising of the Mercury from the Cistern below in the *Torrillian* Tube, to shew to what Degree the Recipient is exhausted. This Gage is represented by the Letter G. S expresses the Body of the Syphon or *Air Pump*, which is work'd Horizontally by means of the Handle of the Piston b: By which means the Recipient is very easily exhausted, the Valves much better supplying the Use of the Stock-cock in other Engines of this Nature.

And when the Experiment is over, and you would let the external Air return again into the Receiver, in order to take it off the Engine, you need only unscrew a little the Elbow above-mentioned, by turning the *Air Pump* about from the Left Hand towards the Right, as far as Liberty allows, and then the Air will easily insinuate it self between the Joints of the Screw: Or you may let the Air in also, by unscrewing the Cap at P.

R. 2. is another Receiver, through whose Cap P (which contains a Box, in which are several Collars of Cork and Leather) passes a Brass Wire as W, moveable up and down in the Cap, without letting in any Air into the Receiver, and on whose Hook K, may any thing be suspended or fastened in an Experiment.

F is a small *Air Pump* applicable to a Cupping-Glass, by which 'tis easily affixed to any part of the Body, without Fire.

Y is a Syphon or Syringe for Injection in Anatomical Experiments; having several small Pipes, as C, of differing Bores, to screw on upon it; and receiving a constant Supply of the Liquor by means of the crooked Pipe a.

In the *Memoires de Mathematique & de Physique* for December 1693, you have this general Theorem (from Mr. *Varignon*) about the Proportion of the remaining Air in the (partly) exhausted Receiver, to that which was in the Receiver before you began to pump, viz.

The Quantity of the Natural Air contained in the Receiver before you begin to pump any out, is always to the Quantity of what remains, after any Number of Pumps: As the Capacity of the Receiver, and the Cavity of the Pump together (which Cavity is made by the drawing up of the Sucker) raised to a Power which shall have the Number of the Stroaks of

of the Pump for its Index; is to a like Power of the Capacity of the Receiver alone.

Demonstration.

Let a be the Natural Air, v that which remains after any number of Stroaks of the Pump, r the Capacity of the Receiver, s the Capacity of the Receiver, and the Cavity of the Pump together, n the number of the Stroaks of the Pump (here supposed all equal in force and effect to one another). Then says Mr. Varignon.

which is the Theorem above delivered, in species. To shew the Truth of which, 'tis enough (saith he) to consider, That each time the Piston or Sucker of the Pump is drawn back, the Air in the Receiver must expand it self so as in some measure to fill up the Cavity of the Pump left vacant by the Piston, as well as the Receiver it self. (N.B. He seems to build on the Cartesian Notion of a Plenum, but it matters not, the Calculation is just) wherefore, as now, so after each Stroak of the Pump, the remaining Air in the Receiver and Pump, will be to what was in the Receiver just before, as the Capacity of the Receiver alone, is to that of the Receiver and Pump taken together; that is, as r to s .

Let us make then a, b, c, d, e, f , &c. and at last t and v to denote the different Quantities of Air found successively in the Receiver after each Stroak of the Pump: That is, let a be the Air in its Natural State when you begin first to Pump; b the Quantity of Air there after the first Stroak; c the Quantity of Air after the second Stroak, and so on till you come to the last Stroak, where v represents the Quantity of Air remaining in the Receiver and Cavity of the Pump after any Number of Stroaks; and that Number will be n .

Then will it ever be

$$a. b :: s. r.$$

$$b. c :: s. r.$$

$$c. d :: s. r.$$

$$d. e :: s. r.$$

$$e. f :: s. r.$$

and in one Word,

$$r. v :: s. r.$$

wherefore $a. v :: s^n. r^n$. Q. E. D.

From whence, by way of Corollary, he gives us this Rule.

Let h, k, l, m . represent the Logarithms of the Quantities before-mentioned, a, v, s and r ; then will $b. k :: l n. m n$. that is, those four Terms will be Arithmetically Proportional: Wherefore $b + m n = k + l n$: or $b - k = l n - m n$. Which is the Rule to be used, as follows in the Problems.

Problem 1. The Capacity of the Receiver, and of the Cavity of the Pump being given, or the Ratio between them; together with the Number of the Stroaks of the Pump in the Evacuation of the Receiver; To find the Ratio between the Natural Air, and that now in the Receiver.

The Rule is, keeping to the last mentioned Notation, $b - k = l n - m n$.

Where $l n - m n$ is the Logarithm of the Ratio sought; that is, in Words, The Logarithm of the Ratio of the Natural Air to that in the (nearly suppos'd) exhausted Receiver is always equal to the Product of the Number of the Stroaks of the Pump, multiply'd by the Logarithm of the Ratio between the Capacity of the Pump and Receiver together, and the Receiver alone.

So that these things being given, as in the Supposition of the Problem, the Ratio of the Natural Air, to that which now remains in the nearly exhausted Receiver, is found. Q. E. D.

Let this Ratio be as p to q ; then will $a. v :: p. q$. and consequently $a q = p v$ and dividing all by q ,

the Natural Air will be thus exprest, $\frac{p v}{q}$,

if you have the remaining Air in the Receiver;

and that remaining Air will be exprest thus, $\frac{a q}{p}$

if you have the Natural Air. And supposing both Natural and Remaining Air to be each = 1, they

will be thus exprest: The Natural Air = $\frac{p}{q}$ and

the remaining rarify'd Air = $\frac{q}{p}$

As for Example, Suppose the Cavity of the Receiver to be 10 times as great as that of the Cavity of the Pump left by drawing up the Piston; and that the Number of the Stroaks of the Pump be 30: I demand what Proportion the Air in the (partly) exhausted Receiver bears to the common Air. The Answer is, That there is about the 18th part of the Air which was in the Receiver when you began to Pump.

For in this Case the Logarithm $l - m =$ to the Ratio between the Capacity of Receiver and Pump together, to Receiver alone, will be 413927; which, multiply'd by 30 = n , gives 12417810 for the Logarithm of $l n - m n$, the Ratio of the Natural Air to the remaining Air. Let the Natural Air in the Receiver, before the Pump was set on work, be = 1; then will = 12417810 be the Logarithm of that small Quantity of Air which shall at last remain after the 30 Pumps, which will be the Logarithm of $\frac{1}{18}$ fere; that is, it may be

exprest thus, $\frac{a}{18}$. And therefore, to find the

Weight of all the Natural Air (= a) in the Receiver, we may say, that the re-entred Air at last

let in is = $a - \frac{a}{18}$; and then taking a for its

proper Weight, (as supposing the Weights of Bodies to be proportionable to their Bulks) let p be the Difference between the Weights of the Receiver when full and when exhausted; we shall find

that $a - \frac{a}{18} = p$, which Equation will produce

$a - p = \frac{a}{17}$, for the Weight of all the Natural

Air in the Receiver. In general, if g be put for the Number of which $l n - m n$ is the Logarithm, the remaining Air at last will always be precisely

= $\frac{a}{g}$, its Weight = $\frac{p}{g - 1}$: And the Weight

of the Natural Air = $\frac{g p}{g - 1}$.

Problem 2. The Ratio between the Natural Remaining Air being given with the Number of Stroaks of the Pump, to find the Ratio of the Receiver, to the Cavity of the Pump.

The Rule will be $b - k = l n - m n$, and consequently $\frac{b - k}{g} = l - m$; then will $\frac{b - k}{n}$

be the Logarithm of the Ratio of the Capacity of the

the Receiver alone; which Ratio being also known, viz. as p to q , then will $s, r :: p, q$, and $s - r :: p - q$; that is, the Logarithm of the Ratio of the natural Air to the remaining Air, being divided by the Number of the Strokes of the Pump, will always give for the Quotient the Logarithm of a Ratio, whose Antecedent less the Consequent, will be to the Consequent, as the Pump is to the Receiver; and therefore this Quotient being known, the Ratio between the Pump and the Receiver will also be known. Q. E. I.

From hence, if the Capacity of the Receiver be known, the Capacity of the Pump will be found to be $\frac{r p - r q}{q}$; and if the Capacity of the Pump be known, viz. $s - r = e$, then that of the Receiver will be $\frac{e q}{p - q}$.

Problem 3. The Ratio between the Pump and Receiver being given, together with that of the natural Air to the remaining Air; To find what Number of Strokes of the Pump, are necessary to bring the natural and remaining Air to the given Ratio: Or, in other Words, To rarefy the Air in a given Ratio, with an Engine whose Receiver and Pump are given in Capacity.

The Rule being $b - k = l n - n m$, and consequently $\frac{b - k}{l - m} = n$, it will be, as the Logarithm of the Ratio of Receiver and Pump together, to Receiver alone, is to the Logarithm of the Ratio between the natural and remaining Air: So is Unity to the Number of Strokes of the Pump required: Or, in other Words, the Quotient of the Second of these Logarithms divided by the First, is always equal to the Number of Strokes sought.

AIRY METEORS: See *Meteors*.

AISTETERIUM, the common Sensory, which Cartes would have placed in the *Glandula Pinealis*, but is now generally supposed to be about the beginning of the *Medulla Oblongata* in the *Corpus Striatum*.

AJUTAGE, is the Spout for a *Fets d'eau* in any Fountain: Mr. *Marriot* asserts, That an even polished round Hole in the End of the Pipe, will give an higher Jet than either a Cylindrical or a Conick *Adjutage*; but of those the latter is the best.

ALA, in Botany, signifies the Angle (which generally is acute, and never greater than a Right one on the Foot Stalks of Plants, and is always tending upwards) that either the Leaves or the Foot Stalks of Leaves make with the Stalk, or with any Branch of the Plant. Sometimes also 'tis taken for a little Branch, making an Angle after that manner with the Stalk.

ALABASTRA, in a Plant, are those little green Leaves which compass in the Bottom of the Flower.

ALBA FIRMA, in Land, is an Annual Rent in Money, payable to the Chief or Lord of any Hundred; and *Spelman* saith, 'Tis called *Alba* because it is not paid according to the Custom of old Times in Corn (which was call'd *Blackmail*) but in Silver, or as they say now in some Parts of England, in White Money. There are Tenures of this Nature in *Westmorland*, 2 Part Institut. Fol. 10.

ALBAPITUITA, the same with *Leuco-Phleg-*

ALBUGINEA OCULI, is a very thin white Coat or Tunic of the Eye, adhering to the Cornea, extending it self beyond the Sclerotic, even to the Circle of the Iris, but leaves a Hole forward for the opening of the Apple of the Eye. See *Tunica Adnata*: 'Tis by some Writers call'd *Tunica Conjunctiva*.

ALBUGINEA TESTIS, is the White Membrane immediately involving the Testes or Testicles.

ALBUGO, the Pin and Web, is a white Speck in the Honey Tunicle of the Eye, which hinders the Sight, and usually follows an Inflammation, Wound or Ulcer of that Part. Sometimes it's taken for the *Album Oculi*, or White of the Eye; being that part where the *Tunica Adnata* or *Albuginea* adheres to the Sclerotic.

ALBUM OCULI, sometimes is taken for the same with *Albugo*: But by *Galen* and *Hippocrates* is used for that Tunic of the Eye which is usually call'd, the *Tunica Adnata*; and by some Writers *Albuginea Oculi*: Which see under those Words.

ALCHAICKS, are a sort of Verses consisting of two *Dactyls* and two *Trochees*, as some will have it; but *Fabricius* saith, they consist of 5 Feet, of which the first is a *Spondee* or *Iambick*, the second an *Iambick*, the third a long Syllable, the fourth a *Dactyle*, the fifth a *Dactyle* or *Amphimacer*; as these of *Horace*.

*Vides ut alta stat nive candidum
Soratæ, nec jam sustineant onus.*

ALCHYMIST, is one that studies *Alchymy*; that is, that Sublimer Part of *Chymistry* which teaches the Transmutation of Metals and the Philosopher's Stone; according to the Cant of the *Adeptists*, who amuse the Ignorant and Unthinking with hard Words and Non-sense: For were it not for the *Arabick* Particle *Al*, which they will needs have to be of wonderful vertue here, the Word would signifie no more than *Chymistry*. Whose Derivation see under that Word. This Study of *Alchymy* hath been rightly defined to be, *Arts fine Arte, ejus principium est mentire, medium laborare, & finis mendicare*: That is, an Art without an Art, which begins with Lying, is continued with Toil and Labour, and at last end in Beggery. And so poor *Penotus* found it, who after he had spent his whole Life and Fortune in this vain Study, died at last in an Alms-House at *Yverdon* in *Switzerland*; and used to say, he would recommend the Study of *Alchymy* to a mortal Enemy, whom he did not dare openly to attack.

ALCOHOL, a Term used by the *Chymists* both for a very fine or impalpable Powder; and also for a very pure Spirit well rectify'd or dephlegmated. Thus the highest rectify'd Spirit of Wine is called *Alcohol Vini*. Hence to *Alcoholize* any thing, with them signifies to subtilize; as when any thing is beaten to a very fine Powder, &c.

How to make a tolerable true Alcohol or pure Spirit of Wine, see in *Alcalizate Spirit of Wine*.

ALCOVE, in Architecture is a part of a Chamber separated by an *Estrade* or Partition made by Columns and other corresponding Ornaments, in which is placed a Bed of State, or sometimes Seats to entertain Company.

ALDEBARAN, an Arabian Name for a fix'd Star of the first Magnitude, situate in the Head of the Constellation called the Bull, and therefore is usually named the Bull's-Eye.

ALE-TASTER, is an Officer appointed and sworn in every Court-Leet, to look that there be a due Size and Goodness of Bread, Ale and Beer sold within the Jurisdiction of the Leet.

ALEMBICK, is a Chymical Instrument used in Distilling; it has the shape of an Helment Concave within, and Convex without; and towards the Bottom is placed a Beek or Nose about a Foot and a half long, by which the Vapours descend; sometimes they are made without a Nose, but then they are rather Circulatory Vessels, and the Head is called a *Blind-Head*: They are made usually of Copper tinn'd within-side; and often of Glafs.

ALEOPHANGINÆ (*Pillule*) are purging Pills composed of Aloes and several Spices.

ALERSANS JOUR, (a Law Term) signifying to be finally dismiss'd the Court, because there is no further Day assign'd for Appearance.

ALEXIPHARMICK MEDICINES, are such as are used as Antidotes against Poison, or any Infectious Disease; or to raise or strengthen the decayed or drooping Spirits in malignant Distempers.

ALEXITERICAL, } the same with *Alexiphar-*
ALEXITERICK, } *mick*.

ALGAROT, In Chymistry, signifies a strong Emetick and Cathartick Powder, the same as *Mercurius Vite*, being made of Butter of *Antimony* precipitated into a white Powder, by being washed or diluted in a large Quantity of warm Water.

ALGEBRA, the wonderful Analytick Art, or the Art of Equation. In *Arabic* is called *Al-giabr W'al-mokabala*, from the former of which Words we call it *Algebra*; and it may be render'd, either the Art of Restitution and Comparison, or the Art of Resolution and Equation. *Lucas de Burgo*, the most Ancient European Writer of *Algebra* we have, defines it *Restauratiois et Oppositionis Regula*.

The *Italians* gave it the Name of *Regula Rei et Censui*; that is, the Rule of the Root and the Square, because they call the Root *Res*, and the Square *Census*; and from *Cosa* in the Italian Language, for *Res* or the Root, comes the Word *Cosick*: For some Writers call the Powers of Numbers, as the Root, the Square, Cube, &c. *Cosick Numbers*.

Cardan calls it, and that very justly, *Ars magna*, The great Art; following therein *Lucas de Burgo*, who styles it in Italian, *L'Arte Maggiore*.

It was certainly of Old in use amongst the *Greeks*, but purposely concealed as a very great Secret. We have some Examples of it in *Euclide*, or at least in *Theon* upon *Euclide*, who tells us, it was first communicated by *Plato*: There are also Instances of this Art in *Pappus*; and we find the Effects of it plainly in *Archimedes*, *Apollonius*, and some others, tho' studiously covered and disguised. The first Books among the *Greeks*, and, I believe, the only one that treats professedly of *Algebra*, is that of *Diophantus*: Published at first in Latin by *Xylander*, afterwards in Greek and Latin by *Bachet*, with some things added of his own; and since him by *Mr. Fermat*, with some Additions of his likewise. But it certainly was in use among the *Arabs* more anciently than among the *Greeks*; and they are supposed to have had it from the *Persians*, and the *Persians* from the *Indians*. Thence, that is, from the *Arabs*, the *Moors* and *Saracens* brought it into *Spain*, from whence it came into *England*; and that before we knew any thing of *Diophantus*. The Use of the Numeral Figures, Mathematick

Learning and all our old Astronomy, came to us likewise the same way from the same Original, and about the same time.

The first European Writer of *Algebra* (as was hinted above) is *Lucas Pacciolus* or *Lucas de Burgo* a Minorite Frier: His Book is in Italian, printed at Venice 1494. He makes mention of one *Leonardus Pisannus*, and several others, from whom he learn'd it, but we have none of their Writings. He says, this Art came Originally to us from the *Arabs*, and makes no mention of *Diophantus*, who therefore 'tis probable was not yet known here. His *Algebra* goes no farther than Quadratick Equations.

Next came out *Stiphelius*, a good Author, but he also went on beyond Quadratics.

But *Scipio Ferreus*, *Cardan*, *Tartalea*, and some others, proceeded to give a Solution of some Cubick Equations.

After this *Bombelli* went a little farther, and shew'd how to resolve a Biquadratic Equation into two Quadratick ones, by the means of a Cubick.

Then, in the last Century, appear'd *Nonnius* (*Nunnez* in Spanish) *Ramus*, *Schonerus*, *Saliquacus*, *Clavius*, &c. who wrote on this Subject in various ways, but generally went no farther than Quadratick Equations.

About this time out came *Diophantus*, whose Method differs much from that of the *Arabs*, which others had hitherto followed.

All this while, the known Quantities in any Equation, were design'd only by the Numerical Letters, and there were no Symbols nor Marks but for those that were unknown or sought.

But then came *Vieta*, A. D. 1590, and introduced what he called his *Specious Arithmetick*; which is a way of giving Marks or Symbols to all the Quantities, both known and unknown; whereby a very short and conspicuous way of Notation was gained, the whole Operation expos'd always to the Eye in a short Synopsis, and many Discoveries were made in *Algebra*, not before taken notice of.

Vieta also introduced the *Numeral Exegesis* of affected Equations, shewing how to extract their Roots in Numbers. And in the Denomination of the Powers of Numbers, he follows *Diophantus*, and not the *Arabian* manner used by others.

The Incomparable *Mr. Oughtred* followed, and mightily improved the *Specious Algebra* of *Vieta*, in his *Clavis Mathematica*, first published 1631: He also affecting Brevity, (which indeed he was a perfect Master of, being short, but not obscure) invented many Compendious Characters or Ligatures to note the Sums, Differences, Rectangles, Squares, Cubes, and their Sum, Difference, &c. by which means his little Book contains more excellent and useful Geometry, than many other large Volumes. *Oughtred* in his *Clavis* usually contents himself with the Solution of Quadratics, rarely proceeding to those of higher Powers, because he design'd it as an Introduction to *Algebra* only.

The Famous *Mr. Harriott* was Contemporary with *Oughtred*, but died before him; he left many good things behind him, of which nothing is yet published but his *Analytice or Algebra*, which *Mr. Warner* printed A. D. 1631. From this great Man did *Des Cartes* borrow, not to say steal, all the famous things in his *Geometry*, which are purely Algebraical, as any one may see, that will compare their Methods together: For 'tis impossible but one must be Copied after the other: But the *Geometry* of *Des Cartes* was not published in French till the

the Year 1637, and not in *Latin* till the Year 1649: Therefore he must have seen and copied Harriott's Book.

Mr. Harriott did wonderfully improve (in this Treatise) that which is purely *Algebra*, in the following Respects, and many others which I might mention.

1. He brought in small Letters instead of the Capitals used by *Vieta* and *Oughtred*.

2. He waved the uncouth Terms of *Quadrato-Cube*, *Sursolid*, &c. explaining the Power plainly to the Eye, by only repeating the Root as often as the Index of the Power.

3. He shewed the true Original and Constitution of all Equations, by putting all the Equation over to one side; and thereby making the whole equal to nothing; whereby also he determined the Number of Roots, which he shews are in Number, such as the Index of the highest Powers in the Equation.

4. He discovers the true Construction of the absolute Number (the *Homogeneous Comparationis*) in a Quadratick or Superior Equation; shewing it to be the Product of the continual Multiplication of all the Roots.

5. The same he doth also by the Co-efficients.

6. He shews the way to multiply the unknown Roots of an Equation according to any Proportion assigned, thereby freeing the Co-efficients from Fractions and Surds.

7. He shews how to reduce the adjected Quadraticks, to simple Equations, and all adjected Cubicks to a Form easily solvable, by the means of destroying the second Term in such Equations.

8. He shews the Method (and a very good one 'tis) of solving all adjected Quadraticks by completing the Square.

9. He mightily also improves the *Exceffus Numerola*, invented by *Vieta*.

All these vast Improvements, and many more (which, to avoid Prolixity, I omit) did *Des Cartes* take from Harriott, without ever so much as naming him, and publish them as his own. 'Tis true, in his *Geometry* there are abundance of excellent Things about the Accomodation of *Algebra* to Geometrical Propositions, and many very fine Geometrical Effusions and Constructions; but this was not Harriott's Business, who kept himself up pure *Algebra* only. As to which *Des Cartes* hath added but one single Rule (and even that is plainly deducible from Harriott's Principles) over and above what is in Harriott; and that is, the Method of dissolving a Biquadratick Equation, whose second Term is wanting, into two Quadraticks, by means of a Cubick Equation of a plain Root; and this, after all, both *Bombell* and *Vieta* had done before him. And thus leaving the French Plagiary, I come next to another of Our Country Algebraists, Dr. Pell, who revised and altered a Piece of *Algebra* first published in *High Dutch*, A. D. 1659, at Zurich; and after translated into *English* by Mr. Thomas Brancher, and printed, A. D. 1688, and called, *An Introduction to Algebra*: In which Dr. Pell gives us a peculiar Method of his own for applying *Algebra* to Problems of divers Sorts; and introduces a way of keeping a Register of the whole Process in the Margin. He shews also there how to judge whether a Problem be fully determined or not; which is by this Rule (as Dr. Wallis interprets him). If the Number of the Data, or Things given in any Question, be (independent of each other) fewer than the

things sought, the Question is not fully determined, but is capable of innumerable Answers or Solutions.

But if the Number of both Data and Quæsitæ be the same, the Question is then determined to either to some one, or to some certain Number of Solutions.

And when the Data are more in Number than the Quæsitæ, so many as exceed are always superfluous, and sometimes, it may be, are contrary to, or inconsistent with others, and consequently render the thing impossible.

Dr. Pell also, besides the former Characters, introduced this Mark \ominus for *Involution*, and this \cup for *Evolution*, as he calls it, i. e. for *Squaring*, *Cubing*, &c. of any Quantity, and for *Extracting the Square*, *Cube*, &c. Roots out of any Quantity. He makes also the Mark : to stand for *Division*, and Registers the several Steps of the whole Process by Numeral Figures in their Order in the little Column in the middle; keeping an Account also in Symbols of the several Operations in the Column towards the Left Hand, that so you may see how any Quantity or Equation in the large Column towards the Right Hand is produced. In which very good Method he is follow'd by Mr. Ward, in his small Treatise of *Algebra*.

Algebra is well enough divided into

1. *Numeral or Vulgar*; which was that of the Ancients, and served only to find the Solution of Arithmetical Problems, without any Demonstration; such as those given us by *Diophantus*, &c.

2. *Specious or New*, called sometimes *Logistica Speciosa*, and often *Species* alone; which since *Vieta* hath been perform'd by Letters of the Alphabet. And this way of Notation is very pleasing to the Mind, assisting to the Imagination, and easy to the Memory. This also is no ways limited, like the former *Algebra* to any one certain kind of Problems, but serves equally for the Investigation and Demonstration of all Theorems; especially if to those two you add the new Methods of

3. *Fluxions*; a large Account of which you will have under that Word.

And the several Operations of *Algebra*, such as *Addition*, *Subtraction*, *Multiplication*, *Division*, *Extraction* of Roots, *Fractions*, *Equations*, &c. you will find Directions how to perform under those several Words.

ALGENEB, a fix'd Star of the second Magnitude in the right side of *Perseus*, whose Longitude is 57 Deg. 17 Min. Latitude 30. 5. Right Ascension 44 Deg. 15. Min.

ALGOL, or *Medusa's Head*, a fix'd Star of the third Magnitude, in the Constellation *Perseus*, whose Longitude is 51. 27. Latitude 22. 22. and Declination 39. 39.

ALGORITHM, sometimes call'd *Logistica Numeralis*, is the Sum of the principal Rules of Numerical Computation; of which they commonly reckon Five, *Numeration*, *Addition*, *Subtraction*, *Multiplication* and *Division*; to which may be added *Extraction* of Roots.

ALGORISM, is the Practical Operation in the several Parts of *Specious Arithmetick*, or *Algebra*; and sometimes the Word is used for the Practice of Common Arithmetick by the ten Numeral Figures.

ALIDADA, the Label or Ruler which is moveable on the Centre of an Astrolabe, Quadrant, &c. which carries the Sight. It is so called by the Arabian Writers of Mathematicks, from whom we took and retain several Arabic Terms, as *Azimuth*, *Zenith*, *Nadir*, *Almacanter*, &c.

ALIEN,

ALIEN, a Subject born in a Foreign Country, who (by our Common Law) is not capable to inherit Lands in England, till Naturaliz'd by Act of Parliament.

ALIENATION, is (in Law) making a thing another Man's, or to alter or put the Possession of Lands, or other things, from one Man to another; and in some Cases a Man hath Power in himself to do so, without the Assent or Licence of any other, and in some not.

ALIFORMES MUSCULI, *Alares, Pterygoide*, are Muscles arising from the Pterygoide Bones (the Process of the *Os Cuneiforme*, partly with a Nervous Beginning, and partly Fleshy; and ending in the Neck of the lower Jaw, and towards the internal Seat of the Head.

ALIFORMES PROCESSUS, are the Prominences of the *Os Cuneiforme*, from the fore Part; the same with the *Pterygoide*.

ALIMENT, is whatever serves to nourish, supply the Decays of, and to recruit an Animal or Vegetable Body.

ALIMONY, formerly signified Nourishment or Maintenance; but in a Modern Legal Sense, it is that Portion or Allowance which a married Woman sues for upon any Occasional Separation from her Husband, wherein she is not charged with *Elopement* or *Adultery*. This was recoverable in the Spiritual Court, but now only in Chancery.

ALIQOT PART of a Number, is such an one as will exactly measure it without any Remainder. But an

ALIQANT PART, is that which cannot measure any Number exactly, but that some Remainder will be left. Thus 3 is an Aliquot Part of 12, because being taken 4 times it will just measure it; but 5 is an Aliquant Part of 12, for being taken twice it falls short, and when taken 3 times it exceeds 12.

ALKAHEST; one of the canting Terms of the *Alchymists*, by which they intend an Universal *Menstruum* that will dissolve all manner of Bodies; and by which they pretend to extract the Sulphur of Metals. Some Chymists have given this mighty Name to the *Tincture*, or *Liquor of Flints*, which is a Solution of them made (after Calcination) by the means of Salt of Tartar; and others to the *Liquor of Fixt Nitre*, which is Nitre calcined and fixed, by burning powder'd Coals with it, and at last run into a *Deliquium*, by being set in a cool Cellar, as Oyl of Tartar per *Deliquium* is made. *Van Helmont* calls this Liquor sometimes *Ignis Gebenne*: He pretends to be Master of it himself, and Mr. Boyle is inclined to believe him. *Helmont* saith, it would dissolve all Bodies, without leaving any *Caput Mortuum*, and was as fit for a new Operation after it had dissolved one kind of Body as at first; it would dissolve Metals, Marchasites, Stones, and even Glass it self when finely powdered.

'Tis found, that the common *Menstruums*, such as *Aqua Fortis*, Spirit of Nitre, &c. when they have once dissolved any Metal, are render'd incapable by it of any further Service, having the Points or Edges of their *Acids* so broken, that they can hardly dissolve any more of the same, or any other Metal. Therefore this immortal *Alkaest* had, in this respect, a wonderful Preheminence, if what they relate of it be true. And to shew that something of this Nature is possible, Mr. Boyle says, That he distill'd a Spirit from Verdigrise, which would serve more than once as a *Menstruum* to dissolve Bo-

dies. or to draw Tinctures, and being drawn off, was ready for the same Operation anew.

ALKALISATE SPIRIT OF WINE; So Mr. Boyle calls a Spirit of that Liquor distill'd from Salt of Tartar, or Tartar calcined to Whiteness: And by so drawing off Spirit of Wine from that Salt, you may get easily a pure and rich dephlegmated Spirit (viz. one that shall burn all away, and fire Gunpowder) after this manner;

Put about an Inch thick of Tartar calcined white, into a Glass as long and slender as you can procure, and then put upon it Spirit of Wine that hath been once rectified, to a Finger's Height above the Tartar; and sitting on a Head, draw the Spirit off in a very gentle Heat; or at least, so much of it as you conclude, or find will come pure, and it will answer your Expectation at the first Distillation. The Tartar being dried and new calcined will serve again for a new Operation. If you cannot procure Tartar, Quick-lime, or the Salt of Pot-Ashes will do tolerably well. *Essay of Unsuccessfulness of Experiments.*

ALKALI, a Chymical Word signifying the fixt Salt of any Plant; and is so call'd, because the Herb called *Kali* which is a kind of a *Sea-blite*, *Glass-wort*, or *Salt-wort*, yields such a Salt in a great Quantity. This fix'd Salt of Plants (which is made by burning the Plant, making a *Lixivium* or Lee of its Ashes; and after filtrating the Lee, evaporating the Moisture over a gentle Heat, that the fix'd Salt may remain at the Bottom of the Vessel) being render'd very Porous by the Fire's passing so often thro' it in its Calcination, and it may be fixing there some of its Essential Salt: And because very many of the fiery Particles do also stick in those Pores, it makes a very great Ebullition or Effervescence when any *Acid Liquor* is mingled with it, and from thence, all Bodies that do, or are supposed to ferment with *Acids*, are now always call'd *Alkalies*, or *Alkalisate Bodies*; not because they must always contain any Hidden Alkali in them; which some Chymists assert as necessary to the Cause of Fermentation; but because they are of the Nature of *Alkalies* themselves, and have their Pores naturally so form'd, in such a Proportion, as that they are fitted to be penetrated and put into a violent Motion by the Points of the *Acid* poured upon them. These fix'd Salts of Plants are called *Fix'd Alkalies*: but the Volatile Salts of Vegetables, because they will ferment with *Acids*, are called *Volatile Alkalies*.

ALKERMES, in Pharmacy, is a Confection described in the *Dispensatory*, and sold in the Shops, and so called from the Arabic Particle *Al* and *Kermes*, which are Red or Scarlet Grains, the chief Ingredient in the Confection.

ALLANTOIS or **ALLANTOIDES**, is the Urinary Tunic placed betwixt the *Amnion* and the *Chorion*, which by the Navel and *Urachus* (or Passage by which the Urine is convey'd from the Infant in the Womb) receives the Urine that comes out of the Bladder: It's called likewise *Farciminales*, because that in many Brutes it's of the Shape of a Gut-pudding, but in Man, and some other few Animals it is round, and like the thin soft Skin which wrapperh the Child in the Womb.

The Ingenious and Accurate Dr. Richard Hale, of *Trin. Coll. in Oxford*, in *Phil. Transact.* N. 271 hath obliged the World with a more perfect Discovery of the Human *Allantoin*; and assign'd the Reasons why those who believed its Existence had not before

fore fully found it out; giving also an Answer to the Objections of those, who even still, deny its Reality.

ALLEGATION, is the Citation or Quotation of any Authority, Book, &c. to make good any Point or Assertion.

ALLEGORY, is a Figure in Rhetorick, consisting of one continued Metaphor, carried on thro' the whole Discourse.

ALLEGIANCIA, is the natural and sworn Allegiance or Legal Obedience which every Subject bears to his Prince.

ALLEGIARE, is to justify and clear himself by course of Law, of the Crime objected to him.

ALLEMANDE, is a kind of grave solemn Musick, where the Measure is full and the Movement slow.

ALLIANCE, properly is a Connection of two Persons or two Families together by Marriage; but it is often extended in a larger Sense, signifie the Leagues, Unions and Treaties made between Princes, &c.

ALLIGATION, is a Rule in Arithmetick (so called from the Numbers being bound or connected together by Circular Lines) relating to the mixture of Merchandizes; as Corn, Wine, Metals, Medicines, &c. one with another; and to the Proportion of the Ingredients in any Quantity of, and the Price of such a Mixture. 'Tis distinguished into two kinds, viz. *Alligation, Medial* and *Alternate*.

Alligation Medial teaches how to find a Mean in the Price, Quantity or Quality between the Extreams; and all Cases in it may be solved by these Propositions and Rules.

1. Having the Quantity of the Ingredients, and the particular Prices, to find the Price or Value of some part of the Mixture.

Rule; Multiply the Ingredients severally by their own Prices, and Divide the Sum of those Products by the Sum of the Ingredients, and the Quotient answers the Question.

2. Having the particular Prices of the Ingredients, and the Sum paid or received for a Mixture bought or sold; to find what Quantity of each was bought or sold.

Rule; Divide the Sum paid or received for the Mixture bought or sold, by the Sum of the particular Prices, the Quotient gives what was required.

3. Knowing the Ingredients of a Mixture, to augment or diminish the Mixture proportionally.

Rule; Sum up the Ingredients; then say, As that Sum is to the Augmentation or Diminution, so is the Quantity of each Parcel of the Mixture to the Quantity of the Mixture desired.

4. Knowing the Nature, Quality, or Fineness of the several Ingredients of a Mixture, to find the resulting Temperament or Fineness of the whole.

Rule; Place the several Quantities of the Mixture in Rows, against which place orderly their several Qualities of Fineness, and multiply each Quantity by its own Quality or Degree of Fineness, then as the Sum of all the Quantities is to the Products of all the Quantities, so is Unity to the Quality or Fineness of Mixture.

Example; There are melted and mixed together two kinds of Silver, one worth 5s. and the other worth 4s. an Ounce, and there were 4 Ounces of the former, and 8 of the latter; what is the value of an Ounce of the Mixture?

s. d.

Oun. s.

Silver $\begin{cases} 4 + 5 = 20 \\ 8 + 4 = 32 \end{cases}$ $12 : 52 :: 1 : \frac{52}{12} (= 4 \frac{4}{3})$

$12 \quad 52$

5. Knowing the Quantities of a Mixture, to find the particular Quantities of any Ingredient in any part of the Mixture.

If the Mixture be compounded of but two things, then say, As the Total of the Ingredients in the Composition, is to the part of the Mixture proposed: So is the Quantity of the Ingredient proposed in the whole Composition, to the Quantity of the Ingredient in the Part desired.

But if the Mixture be decompounded, then you must repeat your Work upon every Mixture.

6. Knowing the Total of a Mixture, with the Total Value, and the Values of the several Ingredients mixed, to find the several Quantities mixed, tho' unequally.

Rule. Multiply the Total of the Mixture by the least Value; subtract the Product from the Total Value, and the Remainder is the first Dividend: Then take the said least Value from the greatest valued Ingredient, and the Remainder is the first Divisor. The Quotient of this Division shews the Quantity of the highest Pric'd Ingredient, the other is the Complement to the Whole: And when more Ingredients than two are in the Composition, the Divisors are the several Remains of the least Value taken from the other. The Dividends are the Remains left upon the Divisions, till o remain there; which will be one fort of the Number of Ingredients, and this defective Ingredient is to be supplied as a Complement; and in Division no more must be taken in every Quotient, than that there may remain enough for the other Divisors, and the last to leave nothing remaining.

II. *Alligation Alternate*, shews the due proportion of every Ingredient entering the Mixture, and counter-changes the Places of such Excesses or Differences as fall out between the Mean Price and the Extreams, ascribing it to the greater Extream which proceeds from the Lesser, and the contrary.

Rule 1. Let every greater Extream be linked with one Lesser.

2. When either of the Extreams be single, and the other Extreams be plural, the single Extream must be linked to all the rest.

3. If both greater and lesser Extreams are not single, then they may be linked so diversly, that sundry Differences may be taken, and Diversities of Answers to the Question, yet all true: But if one of the Extreams be single, there can be but one Answer.

4. The Numbers being linked, take the Difference of each Number from the Mean or common Price, and place this Difference against the Number it is linked to alternately.

5. Every Number linked with more than one, must have all the Differences of the Numbers it is linked to set against it.

6. Those Differences resolve the Question, when the Price of every of the Ingredients is given without their Quantities, and the Demand be to mix them so as to sell a certain Quantity at a mean rate.

7. But when the Quantity of one, with the Price of all the Ingredients is given, and the Demand

mand is to know the Quantities of the other Ingredients, then the *Rule of Three* is to be used.

8. And when the Price of every Ingredient is given, without any of their Quantities, and the Demand be to make up a certain Quantity to be sold at a mean Rate, then all the Differences added together, shall be the first Number in the *Rule of Three*; the whole Quantity to be mixed shall be the second Number; and each Difference apart the several third Numbers: And so many forts mix'd, so many Operations of the *Rule of Three*.

9. A Question may be so propounded, as both Sorts of *Alligation* is needful to the Resolution.

Example.

Suppose a Mixture of Wine of 119 Quarts be required, that must be made up of these several Prices, 7 d, 8 d, 14 d and 15 d, so as the whole may be afforded at 12 d. per Quart.

Having link'd 8 to 14, and 7 to 15, and counterchanged their Difference from the common Price 12 d, I find the Sum of their Differences to be 14, by which dividing 119, the Quotient is $8\frac{1}{2}$ or $8\frac{1}{2}$, or for convenience in Operation $8\frac{1}{2}$.

Quarts.

8	2	$\frac{1}{2}$	2	$\frac{1}{2}$	= 17
14	3	$\frac{1}{2}$	4	$\frac{1}{2}$	= 34
7	4	$\frac{1}{2}$	3	$\frac{1}{2}$	= 25 $\frac{1}{2}$
15	5	$\frac{1}{2}$	5	$\frac{1}{2}$	= 42 $\frac{1}{2}$

14

119

ALLIOTH, the Name of a Star in the Tail of the great Bear, whose Observation is much used at Sea. The Elevation of the Pole or the Latitude may thus be easily found by this Star.

Observe when *Allioth* comes to the Meridian under the Pole, then take the Height of the Pole-Star with a Quadrant, and out of that subtract $2^{\circ} 25'$ the Distance of the Pole-Star from the Pole, the Remainder is the Pole's Height, or the Latitude.

ALLITERATION, (a Figure in Rhetorick) is a repeating and playing on the same Letter.

ALLOCATIONE FACIENDA, is a Writ directed to the Lord Treasurer and Barons of the Exchequer, upon complaint of some Accountant, commanding them to allow him such Sums as he hath by virtue of his Office lawfully and reasonably expended.

ALLOCATION, in Law, is an Allowance made upon an Account.

ALLODIAL Lands are those, for which no Rents, Fines, nor Services are due. Such as *Free-Land*.

ALLODIUM, a Law-term, signifying, every Man's own Land, &c. which he possesseth merely in his own Right, without acknowledgment of any Services, or payment of any Rent to another, which is a property in the highest degree.

ALLOETICKS, are Medicines consisting chiefly of *Aloes*.

ALLOGOTROPHY, with some Writers, is a Disproportionate Nutrition of the Body; when one part (as in the Rickets) is nourished more than the other.

ALLOY, is the Proportion of a Baser Metal mingled with a Finer or Purer; as the Quantity of Copper that is mingled with Gold to make it of a due hardness to be Coined into Money, is called its *Alloy*: And Gold that hath more of this than it ought to have, is said to be of a Courser or Greater *Alloy*. The Proportion of *Alloy* for Gold used in our Mints is about a 12th part.

ALMACANTERS, an *Arabick* Word signify-

ing the same with *Parallels of Altitude on the Globe*: Which see. Some write it *Almicanters*, and others *Almacanters*.

ALMACANTERS STAFF, is an Instrument usually made of *Pear-Tree* or *Box*, with an Arch only of 15 degrees, to take Observations of the Sun, about the times of its Rising and Setting, in order to find the *Amplitude*, and consequently the Variation of the Compass.

ALMONDS of the Throat or the Tonsille; a Glandulous Substance representing two Kernels placed on each side of the Uvula, at the Root of the Tongue. They are covered with the common Tunick of the Mouth, and have Veins and Arteries from the Carotides and Jugulars: They are of a lax and spongy Substance, having several Sinus's within them, in which they contain the Liquor of the Saliva, which they receive from the Bruin, and by dispering it to the Larynx, Jaws, Tongue, and Oesophagus, do moisten and lubricate those Parts. When these are swelled and inflamed by a Cold, &c. they very much straiten the Passage of the Throat, and render Swallowing painful and difficult, and help to make what we call a sore Throat, and as the Country People say, the coming down of the Almonds of the Ears.

ALMUCANTERS, the same with *Almacanters*: Which see.

ALOPECY, is a shedding of the Hair, occasioned by the Pox, or otherwise: So called from a Fox *ἀλώπηξ*, whose Urine is said to make places bald, and barren for a Year, as the Scholiast on *Callimachus* observes; or from a Disease peculiar to a Fox. It is called likewise *ὀψίσις*, from the Figure, because that the parts smooth and destitute of Hair, look winding like a Serpent, in Greek *ὀψίς*. It's common to both these Distempers that the Hair fall of *Areatim*, i. e. by shedding, whence in general this Disease is called *Area*. Blanchard.

ALPHETA, the Name of a Star. See *Lucina Corona*.

ALPHUS, is a Cutaneous Distemper, in which the Skin is rough, and looks here and there as if there were Drops of a white Colour upon it: Some call it *Morpheu*; it differs from the *Leuce*, in that it penetrates not so deep as the *Leuce* doth.

ALRAMECH, a Star's *Arabick* Name, which is the same with *Arcturus*.

ALTERAGE, or **ALTARAGIUM**, is a Word which includes not only the Offerings made upon the Altar, but also the Profit that arises to the Priest by reason of the Altar.

ALTERATION, is, in a Physical Sense, that Motion by which a Body is varied or changed in some Circumstances from what it really was before, tho' as to Sense, its Nature and Bulk appear to continue still the same; so that it consists in the Body's acquiring or losing such Qualities, as whether present or absent, do not essentially change the Subject: And herein it differs from *Generation* and *Corruption*, which Terms express the Acquisition or Loss of the Essential Qualities of any Body. Or otherwise.

ALTERATION, is an *Accidental* and *Partial* Change made in any Body, without proceeding so far as to make the Subject be quite unknown, or to take a new Name or Denomination upon it: Or it may be called the *Acquisition* or *Loss* of such Qualities as are not Essential to the Form of any Body.

ALTERING REMEDIES; such Medicines as serve to purifie and restore the due Mixture of Blood, and other circulating Humours.

ALTERNATE PROPORTION: See the Word *Proportion*, N^o. 8.

ALTERNATE ALLIGATION: See *Alligation Alternata*.

ALTERNATE ANGLES: See *Angles*.

ALTERN BASE, a Term in *Trigonometry*, distinguished from the *True Base*, thus; In Oblique Triangles the *True Base* is always either the Sum of the Sides, (and then the Difference of the Sides is called the *Altern Base*) or the *True Base* is the Difference, and then the Sum of the Sides is called the *Altern Base*.

ALTERNATION, is a Word used by Dr. Wallis, and others for the different Changes or Alterations of Order in any Number of things proposed. Of this that learned Mathematician hath a peculiar Discourse at the end of his *Algebra*. This Alternation is easily found, by only continual Multiplication of all the Numbers beginning at Unity. Thus, if it were required to know how many Changes can be rung on six Bells, you need only write down 1, 2, 3, 4, 5, 6, and then multiply all those Numbers continually one into another, and the last Product gives the Number of Changes, which is 720 Changes.

ALTIMETRY, the Art of taking and measuring of Heights, whether Accessible or Inaccessible: See *Altitudes or Heights*.

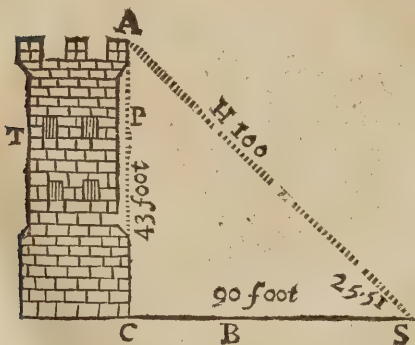
ALTITUDE of the Pole: See *Elevation of the Pole*.

ALTITUDE of MOTION, is a Term used by Dr. Wallis in his *Mechanicks*, for the Measure of any Motion, estimated according to the Line of Direction of the moving Force.

ALTITUDES, or Heights of Places perpendicularly above the *Horizon*, are thus found, whether Accessible or Inaccessible, i. e. whether they are such whose Foot or Bottom you can have access to, or such as you cannot come near.

1. To take an Accessible Altitude at one Station.

Let T be a Tower standing upon a level Ground, whose Height is required, your Station being at S, 90 Foot distant from the Basis of the Tower.



First, with a *Quadrant*, *Theodolite*, or some other graduated Instrument for that purpose, from your Station S, take the Angle of Altitude ASC, 25 Deg. 1 Min. Now, you see that the Perpendicular Height of the Tower AC, the Base CS, and the Visual Line SA, do constitute a Right Angled Triangle, wherein there is given the Base B 90 Foot, the Angle at C a Right one, and the Angle of Altitude taken by Observation 25°. 51'. and therefore the Angle SAC, its Complement to 90 Deg. = 64°. 60'. and the Altitude P is required.

Wherefore, by *Cafe* 1. of *Right Angled Plain Triangles*, the Proportion is,

As the Radius, is to the Base; so is the Tangent of the Angle of Altitude, to the Height of the Tower. That is, R : B :: T, S : P.

And the Operation is performed thus:

To the Logarithm of B, 90 F.	1,954242
Add the Tang. of the Angle S, 25°. 51'.	9,685290
The Sum will be	11,639532
From which Subtract the Radius,	10,000000
The Remainder is the Log. of 43 Feet,	1,639532
Which is the Perpendicular Height of the Tower.	

N. B. Here, and in all such Cafes of this kind, Allowance must be made for the Height of the Eye, or Instrument above the Ground.

You may also, having the former Requisites, viz. the Base and Angles, easily find the Hypotenuse H, or how far it is from the Top of the Tower to the Station, by the second *Cafe* of *Right Angled Triangles*; and this will be useful in many Cafes.

On the *Common Quadrant* you have a Line called the *Quadrat*, which hath two Sides, divided each into 100 equal Parts, and that on the Left-hand is called *Right Shadow*, and that on the Right-hand *Contrary Shadow*.

By which means 'tis very easie to take any Accessible Altitude at one Station by the *Quadrat*; for, if the Angle S be just 45, the Distance to the Foot of the Tower from the Station is always equal to the Altitude: But if the Angle be less than that, the String will fall on *Right Shadow* in the *Quadrat*. Then say, as 100 : Is to the Number of Parts of the *Right Shadow*, cut by the String :: So is the Distance : To the Altitude. So that if the String cut 25, 75, or 50, &c. the Height is accordingly $\frac{1}{2}$, $\frac{3}{4}$, or half the Distance.

But when the String falls towards the Right-hand, and the Angle S be above 45°. then say, As the Parts cut by the Thread in the *Quadrat* : Are to 100 :: So is the Distance : To the Height. Wherefore, if the Thread cut 50 here, the Height is double to the Distance; if it cut 25, 'tis 4 times as great as the Distance, &c.

N. B. By applying what is here said of Distances to the Shadow of any Objects; the taking their Height by the Length of their Shadows, will be easily understood.

2. How to take an Inaccessible Altitude at two Stations.

Let AB (see the following Figure) be a Church, Steeple, &c. whose Height is required; your Station being at D, between which and the Basis of the Steeple, there is a River, so that it is inaccessible, that is, you cannot come to the Foot at B.

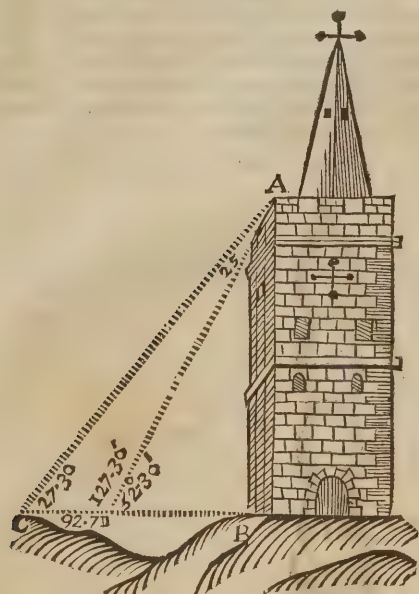
First, from D with your *Quadrant* (or the like Instrument) take the Angle of Altitude ADB, which suppose 52 Deg. 30 Min.

2. Remove your Instrument to another Station, as to C; where take also the Angle of Altitude ACB, 27 Deg. 30 Min.

3. Measure the Distance between the two Stations D, C, which let be 92,7 Foot.

Now, the two visual Lines DA, CA, together with the Distance DC, do make the *Oblique Angled*

gled Triangled ADC , wherein there is given the Angle ACB , $27^{\circ}.30'$; and by the Angle ADB , $52^{\circ}.30'$ Min. you have the Angle ADC , $127^{\circ}.30'$ Min. its Complement to 180 ; and consequently you have the Angle CAD 25° Degrees, also the Side DC $92,7$ Feet.



So that having the three Angles and one Side given, the Side AD may be found, by Case 3d of Oblique Angled Triangles; for the Analogy is,

$$\text{As } \begin{cases} S. DAC : DC :: S. ACD : AD \\ S. 25,00 : 92,7 :: S. 27, 30 : 101,3 \end{cases}$$

By which means you gain AD , they Hypotenuse of the right angled Triangle ADB ; then in the Right angled Triangle ADB , there being given AD , the Hypotenuse, $101,3$, and the Angle ADB $52^{\circ}.30'$, 'tis easy to find the Perpendicular AB .

By Case 6. of Right angled plain Triangles, for the Proportion or Canon is,

$$\text{As } \begin{cases} \text{Rad.} : AD :: S. ADB : AB \\ S. 90, : 101,3 :: S. 52^{\circ}.30' : 80,3 \text{ Feet.} \end{cases}$$

3, To take the Altitude of a Tower Steeple, &c. or the like, which standeth upon a Hill.

Let HK (see the following Figure) be a Tower standing upon a Hill, and you standing at L , desire to know the Height thereof above the Hill.

First, take the Angle HLM 40° Degrees; as also, the Angle KLM 22° Degrees, 3 Minutes.

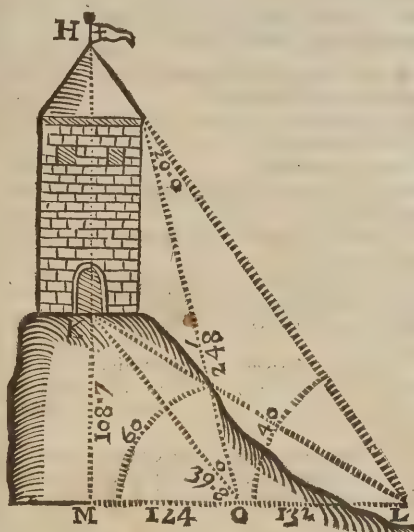
Secondly, remove your Instrument to O , and take the Angle HOM 60° Degrees; as also the Angle KOM 39° Deg. 54 Min.

Thirdly, measure the Distance $OL = 132$ Feet.

Now, in the Triangle HOL , you have given the Angle HLO 40° Deg. the Angle HOL 120° Deg. and the Distance LO 132 Foot. Then, by Case 3. of Oblique angled Triangles,

$$\text{As } \begin{cases} S. LHO : OL :: S. HLO : HO \\ S. 20^{\circ} : 132 :: S. 40^{\circ} : 218. \end{cases}$$

Then, by Case 1. of Right angled Triangles, HM is found to be 214 Foot.



Now, in the Triangle HMO , you have given the Angle HOM 60° Degrees, and HO 248 , or the Perpendicular HM 214 Foot, required, the Base MO ; 'twill be, As Rad : $HO :: S. HOM : MO$ 124 Foot.

Also in the Triangle KMO , there is given MO 124 , and the Angle KOM 39° Deg. 54 Min. required KM , which, by Axiom 2. Plain Triangles, is found to be $108,7$ Foot, which being subducted from HM 214 , leaves $105,3$ Foot for the Height of the Tower.

ALTITUDE, in Astronomy, is of the Sun, Stars, or any Planet or Point of the Heavens, an Arch of an Azimuth Circle, contained between the Horizon and any Parallel of Altitude, or between the Star, Planet, or assigned Point in the Heavens and the Horizon.

To find the Sun's Altitude at any time by the Globe, rectify your Globe, and fit the Quadrant of the Altitude; then turn the Globe about till the Hour Index shew the Time of the Day, and stay it there; after which bring the Quadrant to cut the Sun's Place in the Ecliptic, and then that Place shall shew the Altitude on the Quadrant.

To find the Sun's Altitude and Hour of the Day, when he is due, East or West, and above our Horizon, by the Globe.

Having rectified the Globe, and fitted the Quadrant, bring it to cut the true East Point, and then turn the Globe till the Sun's Place in the Ecliptic cut the graduated Edge of the Quadrant, for then that Place will shew the Altitude, and the Index the Hour.

To find the Sun's Altitude on any Azimuth by the Globe.

Set the Quadrant to the Azimuth given, and then turn the Globe till his Place in the Ecliptic touch the Graduated Edge of the Quadrant, so shall that Place give the Altitude on the Quadrant.

By Trigonometrical Calculation.

1. To find the Sun's Altitude when it is due East or West.

Having the Latitude of the Place, and the Sun's Declination given,

Say, *As the Sine of the Latitude : Is to the Radius :: So is the Sine of the Sun's Declination : To the Sine of the Sun's Altitude required.*

Example, Suppose the Latitude be $51^{\circ} 30'$.
And the Sun's Declination $11^{\circ} 31'$
Then to the Ar.co. of the Sine of $51^{\circ} 30'$, 106455
Add the Sine of $11^{\circ} 31'$ 9,300275
Sum the Sine of $14, 49, 9,406730$
Which is the Sun's Altitude that Day when due East or West.

2. To find the Sun's Altitude on any Hour in the Equinoctial.

Say, *As the Radius is the Co-sine of the Latitude, so is the Co-Sine of the Sun's Distance from the Meridian (or Hour from Noon) to the Sine of the Altitude required.*

3. To find the Sun's Altitude at Six.
Say, *As the Radius is to the Sine of the Latitude, so is the Sine of the Declination to the Sine of the Altitude at Six.*

4. To find the Sun's Altitude on any Azimuth.
Say, *As the Radius is the Co-Sine of the Azimuth, so is the Co-Tangent of the Latitude to the Tangent of the Altitude.*

To find the Sun's Altitude at any time, having the Latitude and Declination given ;

Say, *As the Radius is to the Sine of the Sun's Distance from Six, so is the Co-Tangent of the Latitude to the Tangent of the fourth Ark.*

Which 4th Ark, for Hours between 6 and 6 must be subtracted from, or for Hours, before or after Six, must be added to the Sun's Distance from the Pole, and the Sum or Difference shall be a Fifth Ark.

Then as the Co-Sine of the 4th Ark, is to the Sine of the Latitude, so is the Co-Sine of the 5th Ark to the Sine of the Sun's Altitude.

Sir Jonas Moore gives an easier Method for these Problems ; of which this is his Example for the Hour of the Day.

There is given the Complement of the Sun's Height, his Complement of the Declination, and the Complement of the Latitude of the Place : Required the Angle of the Sun's Distance from the Meridian, or the Hour from Noon.

Write all these down thus ;
Complement of the Latitude $38^{\circ} 30'$. $\left. \begin{array}{l} \text{Sine Comp.} \\ \text{Arith.} \end{array} \right\} 0.205850$
Complement of Declination $76. 53.$ $\left. \begin{array}{l} \text{Sine Comp.} \\ \text{Arith.} \end{array} \right\} 0.011481$
Their Difference is $38. 23$
To which add $60. 00$
Comp. of the Alt. $98. 23$
And their Difference is $21. 37$

Then take the Sum which is $49. 11$ Sine = 9.878984
And the half difference, which is $10. 48$ Sine = 9.272726
Then add the two Arith. Compl. and these two Sines all into one 19.369041
Sum, and it will make 9.684520

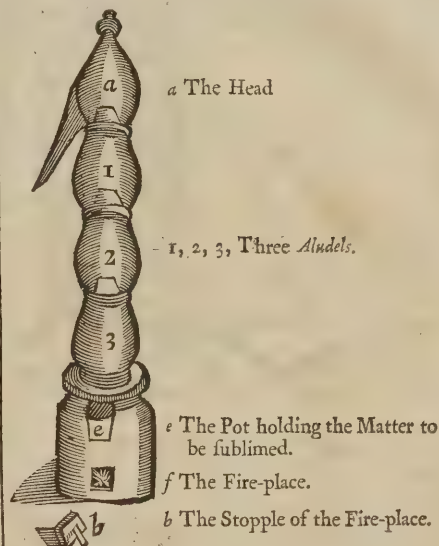
The Half of which will be 4.842260
Which last Quantity is the Sine of $28^{\circ} 56'$. Double those Degrees and they make $57^{\circ} 12'$. which Sum converted into Time make 3 Hours 51 Minutes ; which is the Time that the Sun wants of being at the Meridian,

or it is the Hour of 8 a Clock 9 Minutes before Noon ; or 3 a Clock and 51 Minutes after Noon.

ALTO & BASSO, (or in *Alto*, & in *Basso*) in Law signifies the absolute Submission of all Differences, small and great, high and low, to a Judge or Arbitrator.

ALUDELS, are Pots used by the Chymists in Sublimations : They are without Bottoms and are fitted into one another as many as there is occasion : At the Bottom (in the Furnace) there is a Pot holding the Matter to be sublimed ; and at the Top there is a Head to receive the Flowers that sublime up thither.

This is the Figure of them.



ALVEARIUM, is the Cavity of the inward Ear, near the Passage which conveys the Sound, where that yellow and bitter excrementitious Stuff is bred, call'd *Eav-Wax*.

AMAIN ; a Word used at Sea when a Man of War giveth Defiance to another Ship, or biddeth her strike her Topmasts or yield ; for to bid a Ship Strike *Amain*, is to order her to let fall her Topmasts.

AMALGAMATE, a Chymical Term signifying the mixing Quicksilver with some melted Metal : The Design of which is either to render the Metal fit to be extended on some Works, as in Gilding, &c. or else to reduce the Metal into a very subtle Powder.

The *Amalgama* of Gold is thus made ; Take a Dram of the Regule of Gold, beat it into very thin little Plates, which heat in a Crucible Red hot in a strong Fire, then pour on it an Ounce of pure Quicksilver ; stir the Matter with an Iron Rod, and when you find it beginning to raise a Fume, which will soon happen, cast it into an Earthen Pan filled with Water ; it will co-agulate and become tractable. Wash it often to take away its Blackness, and pressing from it with your Fingers and in a Linen Cloth, that *Mercury* that remains united with the Gold. The Gold will retain a third thrice its weight of the *Mercury*. If you would reduce the Gold into Powder, put this *Amalgam* into a Crucible over a gentle Fire, and the *Mercury*

ry will evaporate into the Air, and leave the Gold at the bottom in an insensible Powder, which you may melt into its Form again; and if it should retain any Blackness from the Mercury, Oil of Tartar per Deliquium will fetch it off.

For Experiment sake, you may make a *Luminous Amalgama* after this manner.

Put into a long Vial 10 Grains of the *Phosphorus* made from Urine, and pour on it two Drachms of Oil of *Aspike*: The Glass must be large enough for two Thirds at least to remain empty. Heat it a little with a Candle, and the *Phosphorus* will dissolve with an Ebullition: Whilst this Dissolution is making, pour into it half a Drachm of pure Quicksilver, shaking the Glass that the Matter may be stir'd and mix'd. You will have an *Amalgama* which will appear all of a Fire in the Dark; but it must, like the *Phosphorus*, be kept close stop'd from Air, else it will soon be spoiled.

If the *Amalgam* of Gold be design'd to be so hard, 'as to be fit to be powder'd, you must use 3 parts of the Metal, and 2 of Mercury; but if you would have it so soft as to spread, you must use 3 parts of Mercury to one of the other Metal.

AMANSES, a barbarous factitious Word which some of the canting Chymists use for counterfeit Gems, and precious Stones.

AMAUIROSIS, is a dimness of Sight, whether the Object be placed near or at distance; but so that no external Fault appear in the Eye, if you inspect it never so narrowly; the Defect consists in the Obstruction of the Optic Nerve: It is called also *Gutta Serena*. Blanchard.

AMBAGES, an idle Circumlocution, or vain connecting together of far fetch'd Words or Sayings, remote from the true purpose of the Speaker.

AMBE, is a superficial jutting out of the Bones: Also a Chyrurgeon's Instrument, with which disjointed Bones are set again.

AMBIDEXTER (in Law) signifies that Juror or Embracor that takes Moneys of both Parties for giving of his Verdict, for which he forfeits ten times as much as he taketh.

And ordinarily, *Ambidexter* denotes that Man that can equally use both his Hands.

AMBIENT, encompassing round about: Thus the Bodies which happen to be placed round any other Body are called the *Ambient*, and often the *Circum-Ambient* Bodies; and the whole Body of the Air, because it encompasses all things on the Face of the Earth, is often by Physical Writers called, by way of Eminence, *The Ambient*.

AMBIT, of any Figure in Geometry, is the Perimeter, Circumference or Sum of all the Bounding or Encompassing Lines that include it.

AMBLIGONIAL, in Geometry, signifies Obtusangular, or that the Sides of any Plane Figure make an Obtuse Angle one with another. Thus an *Ambigonal Triangle* is that which hath one Obtuse Angle.

AMBLIOPIA, is a dulness or dimness of Sight when the Object is not clearly discern'd at what distance soever placed, and proceeds from an imperfect Obstruction of the Optic Nerves, a light Suffusion, want of Spirits, or grossness of the same, &c. Some reckon 4 kinds of *Ambliopia*, viz. *Myopia*, *Presbytia*, *Nyctalopia*, and *Amaurosis*: Which see under those Words. Blanchard.

AMBLOTICK Medicines, are such as Cause Abortion.

AMBUSCADE, a Place where Soldiers hide themselves to surprize the Enemy.

AMENDMENT (a Common-Law Term) signifying the Correction of an Error committed in a Process, and espied before Judgment, but may be amended by the Justices after Judgment; and if there be Error in giving Judgment, they may not amend it, but the Party is to put in his Writ of Error.

AMERCEMENT, (a Term in Law) is a Penalty ass's'd by the Peers, or Equals of the Party amerced, for an Offence done.

AMERCEMENT ROYAL, is when a Sheriff, Coroner, or other such Officer of the King is amerced by the Justices for Abuse in his Office.

Blunt makes this Difference between *Amercements* and *Fines*; that the latter, as taken for Punishments, are Punishments certain, which grow expressly from some Statute; and *Amercements* are arbitrarily, imposed by *Affessors*.

AMETHIST, in Heraldry, is the Term for the Purple Colour in the Coat of a Nobleman; which in all Gentlemen's Escutcheons below that Degree is called *Purple*, and in those of Sovereign Princes *Mercury*.

AMITERE LEGEM TERRÆ, a Law Term, signifying to lose the Liberty of swearing in any Court, to become Infamous; the Punishment of a Champion overcome or yielding in a Fight, or in Battel, and the Jurors found Guilty in a Writ of *Attaint*, and of a Person outlawed.

AMNESTY, is an Act of Oblivion; such as was granted at King Charles's Restauration.

AMNION or AMNIOS, is the innermost Membrane with which the *Fetus* in the Womb is most immediately covered, and with which the rest of the *Secundines*, the *Chorion*, and *Allantois* is ejected after the Birth; it is whiter and thinner than the *Chorion*. It contains not only the *Fetus*, but the Nutritious Humour, whence the *Fetus* by the Mouth and Throat sucks its Nourishment. It is outwardly clothed with the Urinary Membrane and the *Chorion*, which sometimes stick so close to one another, that they can scarce be separated: Tho' it is not knit to the *Chorion* in any Place, save where the Umbilical Vessels pass thro' them both into the *Placenta*. It hath Vessels from the same Origin as the *Chorion*.

Before the *Ovum* is impregnated, this Membrane contains a Limpid Liquor, out of which, after Impregnation, the Embryo is formed. In it (says *Gibson*) resides the Plastick Power, and the Matters also out of which the first Lineaments of the Embryo are drawn; but because its Liquor is so very little, there Transfuses thro' this Membrane the *Amnion*, a part of the Nutritious Albugineous Humour which is contained in the *Chorion*, which it had imbibed out of the *Uterus*, and by the *Juxta-Position* or Addition of its Humour to undiscernible Rudiments of the Embryo, it receives its Encrease. But tho' the *Amnion* have its additional Nutritious Liquor at first only by Transudation, yet when the Umbilical Vessels and the *Placenta* are formed, it receives it after another manner; for then its Liquor at first being separated from the Mother's Arteries by the *Placenta*, and imbibed by the Umbilical Vein of the *Fetus*, it passes directly to its Heart, from whence, being driven out by the *Aorta*, it is sent forth again, in good part, by the Umbilical Arteries, out of whose Cavities, being plentifully dispersed thro' the *Amnion*, it issues

lies into its Cavity: just as the Juices, which are far more gross and viscid than this, do sometimes critically, and often on taking a Purge, ouze into the Intestines out of the small Mouths of the Arteries: Indeed, here the Intervention of the Glands assist this Matter; but 'tis hoped, some curious Person one time or other will discover, that there are such also in the *Aminion*.

AMORTISE (a Term in Law) is to alien Land or Tenements to any Corporation, Guild or Fraternity, and their Successors, which cannot be done without Licence of the King, and the Lord of the Mannor.

AMOUSES, counterfeit Gems, or Precious Stones.

AMPELITE (in Agriculture) is a kind of Black or Bituminous Earth, used about Vines, to make them thrive the better.

AMPHIBOLOGY, a Grammatical Figure, when our Expressions seem to look one way, and are intended another.

AMPHIBLESTROIDES, or the *Tunica Retina* or *Retiformis* of the Eye, is a soft, white and slimy Substance; which is so named, because that being thrown in the Water it resembles a Net; it shoots from the very Centre of the Optick Nerve, and consists of the Medullar Substance of it, and expanding it self over the *Vitreous Humour*, is extended as far as the *Ligamentum Ciliare*, or the Ligaments of the Eye-lids: This Tunic, in that it is whitish and of a marrowy Substance, seems to proceed from the very marrowy and fibrous Substance of the Optick Nerve; so that it is, as it were, an Expansion of Nervous Fibres, which are there gathered into one Bundle, into a Contexture made like a Net; and indeed if the whole Eye were taken for a Flower, growing, as it were, to the Brain by the Stalk of the Optick Nerve, the *Tunica Retina* would be the very Flower it self, and the two other Tunics, the *Sclerotica* and *Choroides*, be only in the Nature of a Stem. This Tunic seems to be the principal Organ of Sight, and receives the visible Species within the Bed of the Eye much after the same manner as a white Wall, or a piece of a white Paper in a darkned Chamber, receives and represents the visible Species which are intrmitted thro' a little Hole: See *Camera Obscura*.

AMPHIBRACHYS, is the Foot of a Latin Verse consisting of three Syllables, where the two Extrems are short, and the Middle long, as *Amare*.

AMPHIBRANCHIA, are Places about the *Glandules* in the Jaws, which moisten the *Asepera Arteria* and *Stomach*.

AMPHIBIOUS, is used for an Animal that lives both on Land and in the Water, as an Otter, Beaver, &c.

AMPHIMACER, is the Foot of a Latin Verse, consisting of three Syllables; the two Extrems long, and the Middle short; as *Castus*.

AMPHIDÆUM, with some Writers is the Summit or Top of the Mouth of the Womb. *Blanchard*.

AMPHIPROSTYLE, a Term in Architecture for a kind of Temple of the Ancients, which had four Columns in the Front, and as many in the Face behind.

AMPHISCII, so the Inhabitants of the *Torid Zone* are called in respect of their Shadows; because their Shadows fall both ways, viz. to the South (as ours always do to the Northward) when the Sun is beyond them in Northern Signs, and to

the North when the Sun is to the Southward of them in Southern Signs.

AMPHISMELA, is an Anatomical Instrument used in the Dissection of Bones.

AMPHITHEATRE, is a Place built for Acting and seeing of Publick Spectacles and Stage-Plays: The common Theatre was but semicircular, but this was built entirely round, or in a Form of a perfect Circle.

AMPLIATION (in Law) signifies a deferring of Judgment till the Cause be further examined.

AMPLITUDE of the *Sun* and *Stars*, is an Ark of the *Horizon* intercepted between the true *East* and *West* Point of it, and the Center of the *Sun* or *Stars* at their Rising or Setting; and so is either *North* and *South*, or *Orrise* and *Occasus*.

To find the *Sun's Amplitude*, either Rising or Setting by the Globe, bring the *Sun's* Place to the *Horizon* either on the *East* or *West* side, and the Degrees from the *East* Point either *North* or *South*, are the *Amplitude* required.

To find the *Sun's Amplitude* Trigonometrically: having the *Latitude* and *Sun's Declination* given.

Say, As the Co-sine of the *Latitude* is to the *Radi- us*, so is the *Sine* of the present *Declination* to the *Sine* of the *Amplitude*.

Example, Suppose the *Latitude* to be 51 deg. 30 min. and the *Declination* of the same 11 deg. 50 min.

Then, to the Ar.co. of } 50°. 30'. 0, 2058503
the Co-sine of }

Add the *Sine* of - - - - 9, 3118926

Sum is the *Sine* of - - - - 9, 5177429

Which is the *Amplitude* required.

AMPLITUDE MAGNETICAL: See *Magnetical Amplitude*.

AMPLIFICATION (in Rhetorick) is a Figurative Speech aggravating a Crime, enlarging in Praise of another, insisting upon a Relation, &c.

AMPUTATION, is the Surgeon's Term for the cutting off any Member of the Body.

AMULET; any thing that is hung about the Neck or any Part of the Body, supposed to be good against Witchcraft or Diseases. These were called anciently *Prebia*, *Aporopæa*, *Phylacteria*, *Amynteria*, *Alexiteria*, and *Alexipharmaea*.

AMUNITION, in the general, is all Sorts of Warlike Stores and Provisions; especially Powder and Ball.

AMMUNITION-BREAD, in an Army, is that which is provided for and distributed to the Soldiers.

AMY (is a Law Term) signifying the next to be trusted for an Orphan or Infant.

AMYGDALATE, in Pharmacy, is an Artificial Milk, or Emulsion made of blanch'd Almonds, &c.

AMYGDALÆ: See *Tonfille*.

ANA, a kind of barbarous Word used amongst the Writers of Pharmacy, and signifies that an equal Quantity of those Ingredients with which it is connected, is taken for the Composition of any Medicine.

ANABIBAZON, the *Dragon's Head*, or the Northern Node of the *Moon*, where she passes the *Ecliptick* from *South* to *North Latitude*, is sometimes so called.

ANABROCHISMUS, is a way of drawing out the inverted pricking Hairs of the Eye-lids, by means of a Thred of a fine Silk in the Eye of a Needle

Needle, which when you have doubled; you put the Hair thro', and so draw it out.

ANABROSIS, is a consuming or wasting of any Part of the Body by sharp Humours.

ANACAMPTICK, signifies Reflecting; 'tis frequently used in reference to Echoes, which are Sounds produced *Anacamptically*, or by Reflection: And therefore *Anacampticks* is by some taken for *Catoptricks*.

ANACATHARSIS, is a Medicine that discharges Nature by some of the upper Parts; as a thing that provokes to Vomit, to Sneezing, to Salivation, &c. in which last Sense *Hippocrates* used the Word, as *Galen* saith.

ANACATHARTICK MEDICINES, are such as cause Vomiting.

ANACEPHALEOSIS, is a brief Summary or Recapitulation of the Heads of any Matter spoken or delivered in Writing.

ANACHRONISM, an Error in *Chronology*, an undue Connexion of Time, or a false Chroni-
cling.

ANACLATICKS, a part of *Opticks* which treats of all sorts of *Refractions*, and is the same with *Dioptricks*.

ANACOLLEMA, is a kind of Linement or dry Medicine, to be apply'd to the Forehead or Nose, in Diseases of the Eyes, or to stop Bleeding; also a Medicine which will breed Flesh and conglutinate the Parts.

ANACREONTICK VERSE, is a kind of Verse consisting of seven Syllables, without being tied to any certain Law of Quantity; so call'd from its Author *Anacreon*, a *Lyrick* Poet.

ANADIPOLOSIS (a Figure in *Rhetorick*) when one Verse begins with the same Word the last ended with. 'Tis also sometimes used in Medicine, for the Redublication of the Paroxysms or Fits of Feavers; and in this Sense 'tis call'd by some Writers *Epanadiplotis*.

ANADOSIS, is sometimes used for whatever tends upwards in the Body, as a Vomit, &c. but most usually for the Distribution of the *Clyle* thro' the proper Vessels.

ANAGLYPHICK ART, is the Art of Carving, Engraving, or Embossing.

ANAGOGICAL, the same with *Mysterious*, or which hath an elevated, raised, uncommon Signification, or which raises the Mind up to Divine Contemplations.

ANAGRAM, is the Transposition of the Letters of any one's Name, Title, &c. in order to make out from thence something to the Honour of the Person. Thus *Galen* by Transposition is *Angel*, &c.

ANA LEMMA, is a Projection of the Sphere on the Plane of the *Meridian*, Orthographically made by straight Lines and *Ellipses*, the Eye being supposed to be at an infinite Distance, and in the *East* or *West* Points of the *Horizon*.

To describe the Annalemma.

With 60 Degrees of — the Line of Chords, describe the *Meridian* *ZHNb*, which is the *Primitive* Circle.

Then draw the Diameters *ZN* and *Hb* at Right Angles one to another: Then will *Hb* be the *Horizon*;

P the North Pole, elevated above the *Horizon* 51°. 30'.

p The South Pole.

Pp The *Axis* of the World.

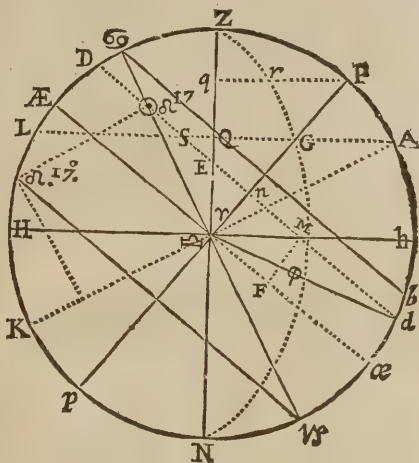
Æ æ The *Equinoctial* at Right Angles with *Pp*.

Z The Zenith.

N The Nadir.

ZN The *Axis* of the *Horizon*, the *Prime Vertical* Circle, or *East* and *West* *Azimuth*.

The Annalemma for the Lat. 50°. 30'. North.



At the Distance of 23 Deg. 30 Min. (on the Limb) each way from *Æ* and *æ* draw,

Æb The *Tropic* of *Cancer*.

vs o The *Tropic* of *Capricorn*; draw also

Ævs The *Ecliptic*, and at Right Angles to it

AK The *Axis* of the *Ecliptic*.

Let *Dd* drawn any where parallel to the *Æ* Equator, and representing a Parallel of the *Sun's* Declination, or the *Sun's* Diurnal *Ark* for that Day.

M } the Point of Rising or Setting.
D } the *Sun's* Culminating, or being on the Meridian.

Then will *VM* represent the *Sun's* Amplitude, and the parts of the Parallel.

DM } the *Sun's* Semi-Diurnal } *Ark*,
dM } Nocturnal }

n *⊙* The like Sine of the *Sun's* Right Ascension.

Mn The like *Ark* of his Ascensional Difference.

HD The *Sun's* Meridian Altitude.

LA A Parallel of Altitude or *Almacantar*.

VL or *q*, the Sine of the *Sun's* Meridian Altitude when he is at *L* and at *D*.

To find the Arches of Lesser Circles, which Mr. Oughtred calls *Like Arks*; Say,

As the Semi-Diameter of any Parallel is to the like Distance in that Parallel, so is the Radius of the Primitive Circle to the Sine of the true Distance from the Center.

So that if by this Method, you will find *nM*, the like Sine of the Ascensional Difference.

To the end of the Parallel *Dd*, draw the Radius *VD*, and from the Point *M*, draw *EQ* parallel to *Pp*; that Parallel will cut the Legs of the Triangle *VDn* proportionably; so that

n d :: *n M* :: *VD* :: *VF* (= *VF*) the Sine of the Ascensional Difference.

If the Sum be in the 17th deg. of *Leo*; then he must be 47 deg. distant from the first degree of *Cancer*.

Wherefore

Wherefore set 47 deg. on the Limb, from \odot to \mathcal{Q} 17, and from thence take the nearest Distance to k γ , the Axis of the Ecliptick, and set it from γ to \odot on the Ecliptick, so shall it be the Sine of the Ark \mathcal{Q} 17 k , 43 Deg. or the Sine of the Sun's Distance from the next Equinoctial Point.

To describe the *Azimuths*, Meridians or Hour Circles, which in the *Analemma* are *Ellipses*.

As suppose, to draw an *Azimuth* through the Points Z M N .

Draw as many Parallels as you will to the Horizon, 'twill always be, as

γ b : γ M :: $\mathcal{Q}\mathcal{A}$: $\mathcal{Q}G$:: Pq : q r , &c.

By this means you may find as many Points as you please, as r , G , to describe the *Ellipses*.

To bring which to practice, set the Sector to the Radius of the Parallel, and then from it take the Sine of the *Azimuth's* Meridian or Hour Circle's Distance from the Prime Verticle Z N , and set it from \mathcal{Q} to G , or from q to r , &c. which will find you as many Points as you please, through which the *Ellipses* must pass.

ANALEPTICKS, are Medicines which cherish and renew the Strength; it signifies also a part of *Hygieina*, or the Art of preserving Health, whereby weak Persons are recovered.

ANALOGY, in Mathematicks, is the Comparison of several *Ratio's* together, much the same with *Proportion*, which see. And 'tis frequently used in common Discourse for the Word *Proportion*.

ANALOGISM (in Logick) a forcible Argument from the Cause to the Effect, implying an unanswerable Necessity.

ANALYSIS, a Resolution of any thing into its component Principles: Thus a Chymist is said to *Analyze* Bodies, when he dissolves them by the Fire, and endeavours to find out their Constituent Parts: And *Algebra* is sometimes called the *Analytick Art*, because it teaches us to solve Questions, and to demonstrate Theorems, by enquiring into the Bottom, into the Fundamental Constitution and Nature of the Thing, which is, as it were, resolved into its Parts taken all to Pieces, and then put together again, that so we may see into the Reason and Nature of it. And in this Sense *Analytical* Demonstrations are opposed to *Synthetical* ones, which see. The Ancients had some Knowledge of this Art, but kept it concealed; whose Invention *Theo* ascribes to *Plato*, and he defined it (according as *Vieta* renders it) *Assumpti Quæstii tanquam concessi, per consequentia ad verum concessum*; a taking of that as granted, or confessed which is enquired after, and thence going back by Consequences to what is confessedly true.

ANALYTICK, in Logick, is a part of that Science teaching to decline and construe Reason, as Grammar doth Words. Our famous *Butler* makes his Impertinent Heroe and Scholar *Hudibras*, to be profoundly skill'd in Analytick.

ANAPÆST, is a Latin Verse, whose Feet consist of three Syllables, the last long and the two first short. Such Verses are called.

ANAPÆSTICK VERSES; they are commonly used in *Tragedies*, where are three Feet which are used in all Parts of the Verse indifferently; as,

*Castos sequitur mala paupertas,
Tutiusque potens regnat Adulter.*

ANAPHORA, (a Figure in Rhetorick) is the Repetition of the same found in the beginning of several Sentences or Verses.

ANAPLEROTICK MEDICINES, are such as help to fill Ulcers with Flesh.

ANARCHY, want of all Government in a Nation where there is no Supreme Authority lodged in either Prince or Rulers; but the People live without any Rule or Government at all, and all things are in the utmost Confusion.

ANASARCHA, is a white, soft, yielding Tumour of the whole outward Body, or of some of its Parts, which dents in by compressing the Flesh; it is caused by the Blood upon a double account; first, when it doth not rightly sanguify or assimilate the Chyle; and again, when it is not rightly accended in the Lungs; the Blood thus perverted, pours forth the *Serum* at the Extremities of the Arteries in greater Quantities than it can receive and reduce by the Veins and Lympheducts, or expelled by the Veins and Pores, and other Passages that send it forth. If the Humours be too viscous, it is called *Leucophlegmatia*. *Blanchard*.

ANASTOMATIQUE, (*Medicines*) are such as open and dilate the Orifices of the Vessels, and by that means help to make the Blood circulate freely, and pass easily out of the Arteries into the Veins.

ANASTOMOSIS, is an Effluxion of the Blood, the Lymph or Chyle, at the meeting of Vessels that close not narrowly: It is also taken for the mutual opening of Veins and Arteries into one another.

ANATOCISM, is the annual Increase or Interest of Money, whether *Simple* or *Compound*. And under it, they also comprehend the Valuation of Annuities. See *Interest*.

ANATOMY, is an artificial Dissection of an Animal, especially Man, whereby the Parts are severally discovered and explained, for the use of Physick and Natural Philosophy; and he that is skilful in this Art, is called an *Anatomist*.

ANCHILE, is the back part of the Knee; also the Contraction of a Joint, especially of the *Ham*.

ANCHOR of a Ship, is a thing as well known as the Ship it self, and also its use; but the Terms of Art used at Sea about its several Parts, Kinds and Uses, are as followeth.

The Parts of an Anchor are, (1.) The Ring, into which the Cable is fastened. (2.) The Beam or Shank, which is the longest Part of the Anchor. (3.) The Arm, which is that which runs down into the Ground; at the End of which is, (4.) The Fluke or Fluke, by some called the Palm, being that broad and pecked Part, with its Barbs like an Arrow-head, which fastens into the Ground. (5.) The Stock, a Piece of Wood fastened unto the Beam near the Ring, serving to guide the Fluke, so that it may fall right, and fix in the Ground. There are three kinds of Anchors, the Kedger, the Grapnel, and the Stream Anchor, (which see under those Words). The Anchors aboard a Man of War, are, the First, Second and Third Anchors; and two of which being always carried at the Bow of the Ship, are therefore called the First and Second Bowyer: The other, which is the largest of all, is called the Sheet Anchor, and is their utmost Refuge when in a great Streets of Weather they are forced to ride on a Lee Shore.

When

Fig. 1

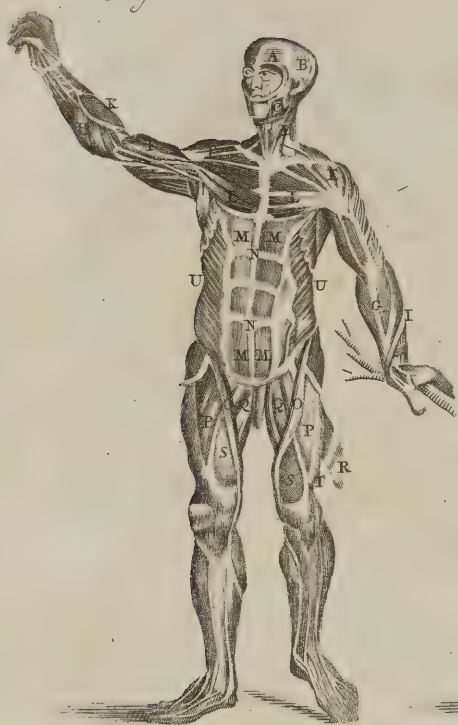


Fig. 2

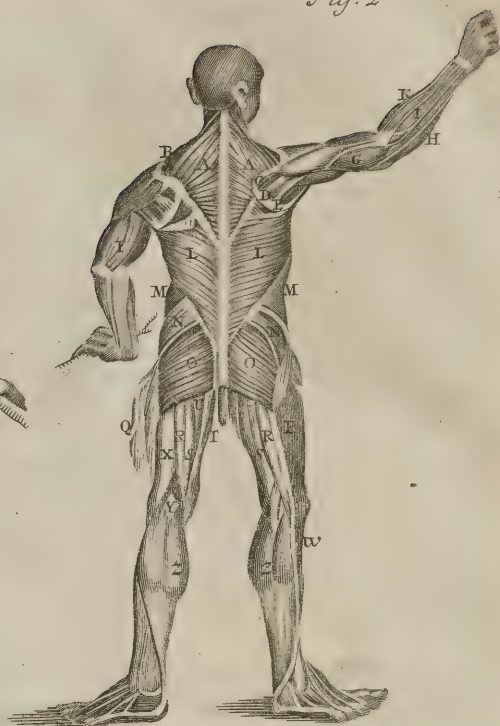


Fig. 3

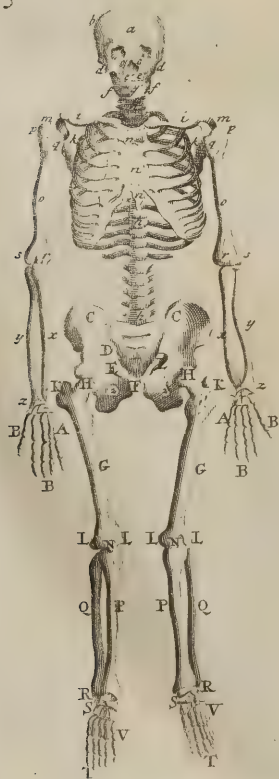
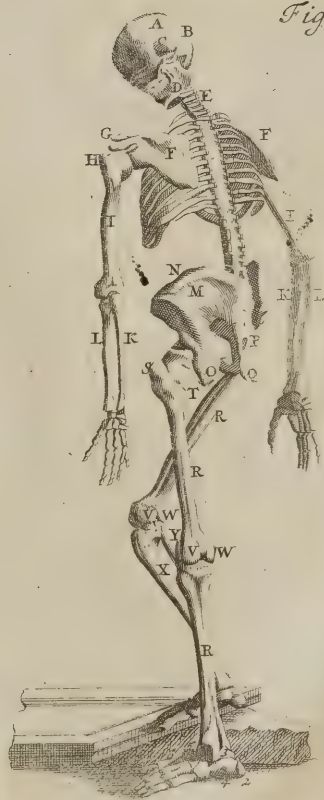


Fig. 4



A Description of the Anatomical Plate.

FIGURE I.

Representing the Muscles of the Fore-part of an Humane Adult Body.

- a* The *Musculus Frontalis*.
- b* The *Temporalis*.
- c* The *Musculus* called *Masseter*.
- d* The *Deltoides*.
- f* The *Biceps*.
- g* The *Extensor Carpi*.
- h* The *Flexor Carpi*.
- i* The *Extensor tertii Internodii Pollicis*.
- k* The *Flexor Pollicis*.
- ll* The *Musculi Pectorales*.
- mm* The *Musculi Recti* of the *Abdomen*.
- nn* The *Linea Alba*.
- uu* The *Musculi obliqui descendentes* of the *Abdomen*.
- oo* The *Musculus Sartorius*, or *Fascialis*.
- pp* The *Musculi Recti Femoris*.
- qq* The *Triceps*.
- r* Part of the *Musculus Membranosus*.
- ss* The *Vastus internus*.
- t* The *Vastus externus*.

FIGURE II.

Representing the Muscles of the Hinder-part of the Body.

- aa* The *Trapezius Musculus*.
- b* The *Deltoides*.
- c* The *Supra Spinatus*.
- d* The *Infra Spinatus*.
- e* The *Teres Major*.
- f* The *Extensor Brachii*.
- g* The *Musculus Brachialis*.
- h* The outward *Extensor Carpi*.
- i* The other *Extensor Carpi*.
- k* The *Musculus Radii longus*.
- ll* The *Latissimus Dorsi*.
- mm* The *Musculi obliqui descendentes Abdominis*.
- n* The *Musculus Quadratus*.
- oo* The *Gluteus Maximus*.
- p* The *Vastus Externus*.
- q* Part of the *Membranosus*.
- rr* The *Seminervosus*.
- ss* The *Seminembranosus*.
- t* The *Gracilis*.
- u* The *Triceps*.
- x* The *Biceps*.
- y* The *Subpopliteus*.
- zz* The *Gastrocnemii*.
- w* The *Peronæus*.

FIGURE III.

FIGURE III.

Representing the Skeleton of an Adult Humane Body on the Fore-side.

- a* The *Os Frontis*.
- b* The *Os Temporis*,
- c c* The *Osse Nasi*.
- d d* The *Osse Jugalia*.
- e e* The Bones of the Upper-Jaw.
- g* The Teeth.
- f f* The Bones of the Lower-Jaw.
- h h h* The *Vertebra* of the Neck, *Thorax*, and *Os Sacrum*.
- i i* The *Clavicula*.
- k k* The *Scapula*.
- l* The Articulation of the *Scapula*, with the *Os Humeri*.
- m m* The Second Process of the *Scapula*, call'd *Acromium*.
- n n n* The Bones of the *Sternum*.
- o o o* The *Os Humeri*.
- p p* The Upper and Outer Head of the *Os Humeri*, which serves to implant the Ligaments upon.
- q q* The Upper and Inner Head of it, which Articulates with the *Scapula*.
- r r* The Innermost Head of its Lower Appendix, which receives the *Ulna*.
- s s* The Outer Head of the same Appendix, which receives the *Radius*.
- x* The *Ulna*.
- y* The *Radius*.
- z z* The Eight Bones of the *Carpus*.
- A A* The Four Bones of the *Metacarpus*.
- B B* The Four Fingers and Thumb, each consisting of three Bones.
- C C* The *Os Ilium*.
- D* The *Coxendix*.
- E* The *Os Sacrum*.
- F* The *Os Pubis*.
- G G* The *Os Femoris*.
- H H* The Upper Head of it, which is received into the *Acetabulum* of the *Coxendix*.
- K K* The Outer *Trochanters*.
- L L* The two Lower Heads of the Thigh-Bone.
- N N* The *Patella*.
- P P* The *Tibia*.
- Q Q* The *Fibula*.
- R R* The *Talus*.
- S S* The *Os Naviculare*.
- V V* The Five Bones of the *Tarsus*.
- T T* The Fourteen Bones of the Toes.
- 2 2* The *Foramena* of the *Os Ischium* and *Pubis*.

FIGURE IV.

Representing the Back-side of an Humane Adult Skeleton.

- a* The *Os Scincipitis*.
- b* The *Os Occipitis*.
- c* The *Os Squammosum*.
- d* The Lower Jaw.
- e* The *Vertebra* of the Neck.
- f* The *Scapula*.
- g* The *Spina Scapula*.
- h* The Outward Head of the *Os Humeri*.
- i* The *Os Humeri*.
- k k* The *Radius*.
- l l* The *Ulna*.
- m* The Back of the *Os Ilium*.
- n* The Spine of the *Ilium*.
- o* The Protuberance of the *Os Ischium*, whence the Muscles arise which bend the Leg.
- p* The *Os Sacrum*,
- q* The *Os Coccygis*.
- r r* The *Os Femoris*.
- s* The *Trochanter Major*.
- t* The *Trochanter Minor*.
- u u* } The two Inferior Protuberances of
- w w* } the Lower Appendix of the *Os Femoris*.
- x* The *Tibia*.
- y* The *Fibula*.
- 2* The *Os Calcis*.
- 3* The *Os Astragali*.
- 4* The *Os Cuboides*.
- 5* The three *Osse Cuneiformia*.
- 6* The *Osse Metatarsi*.

When the Cable is perpendicular between the *Hawse* and the *Anchor*, the *Anchor* is then said to be *a-peek*. When the *Anchor* hangs right up and down by the Ship's Side, it's said to be a *Cock-Bell* upon the Ship's coming to an *Anchor*. To put an *Anchor* down into the Sea, in order to make the Ship *ride*, is called *letting fall* or *dropping* the *Anchor*. They say an *Anchor* is *foul*, when by the turning about of the Ship, the Cable is hitched about the *Fluke*. An *Anchor* is said to *come home*, when it cannot hold the Ship, but that she drives away by the Violence of the Wind or Tide. To *Shoe an Anchor*, is, to put Boards fitted and formed for that purpose on upon the *Flukes*, that the *Anchor* may the better hold in soft Ground.

The Shank of an *Anchor* is to be 3 times the Length of one of its *Flukes*; and a Ship of 500 Tun hath her Sheet *Anchor* of 2000 Weight; and so proportionably for others smaller or greater.

ANCHORING, or *Anchorage*, is Ground fitting to hold a Ship's *Anchor*, that so she may ride it out safely: The best *Anchoring* Ground is stiff Clay or hard Sand; and the best riding at an *Anchor*, is when a Ship is *Landlocked*, and out of the Tide.

ANCHORAGE, (in Law) is a Duty taken of Ships for the *Pool* of the *Haven* where they cast *Anchor*; for no Man can let any *Anchor* fall on the King's Ground in any Port, without paying for it to the King's Officer appointed by Patent.

ANCHYLOPS, the same with *Aegylops*: Which see.

ANCIENT, is the Flag or Streamer in the Stern of a Ship.

ANCON, is the Top or Point of the Elbow, and is taken also sometimes for the backward and larger shooting forth of the *Ulna*.

ANCONÆUS, a Muscle of the *Cubiti*, called so by *Riolanus* from its Situation. It ariseth fleshy from the inferior and back Part of the *Os Humeri*, growing larger as it marcheth between the superior Ends of the *Ulna* and *Radius*, and is inserted fleshy to the lateral Part of the *Brachii externus*, a Thumb's length below the *Olecranon*: It helps to extend the *Cubiti*.

ANCYLOBLEPHARUM, is the growing of the Eye-lids to the *Tunica Cornea*, or to the *Albuginea*, so that sometimes both the Eye-lids grow together.

ANCYLOGLOSSUM, is when the little String under the Tongue is too straitly tied, so that there is a Difficulty of uttering the Words.

ANCYROIDES, the shooting forth of the Shoulder-Bones in the form of a Beak; which is called *Coracoides*, *Anchoralis* and *Cornicularis*.

ANDRATOMY, is a Dissection of Human Bodies, as *Zootomy* is of those of Beasts.

ANDROMEDA, a Northern Constellation consisting of 27 Stars.

ANDROGYNE, an *Hermophradite*, which is of both Sexes, or both Male and Female: The same with.

ANDROGYNUS, an *Hermophradite*, or one who is *Castrate* and *Effeminate*.

ANGLICISM, is the *English* Idiom, or form of Expression, or manner of Speech which is peculiar to *England*.

ANEMOSCOPE, a Machine invented to foresee the Change of the Air or Wind: I have observed, that *Hygroscopes* made of Cat's-gut (according to the Directions which you will find un-

der that Word) are very nice *Anemoscopes*; and never fail hardly by their turning the Index about to foretel the shifting Wind. But, as *Vitruvius* describes an *Anemoscope*, it shews, that the Ancients rather designed it to shew which way the Wind blew, than to foretel to what Quarter it would shift or change.

AN-JOUR and WAST, is a Forfeiture when a Man has committed petit Treason or Felony, and has Lands held of some common Person, which shall be seized for the King, and remain in his Hands a Year and a Day next after the Attaindure; and then the Trees shall be pulled up, the Houses razed and pulled down, and the Pastorage and Meadows plowed up; unless he to whom the Lands should come by Escheat or Forfeiture, redeem it of the King.

ANEURISM, is a Disease which is a kind of Dilatation or bursting of the Arteries, always beating, and swelling sometimes to the bigness of an Egg, which yields if you compress it, but recoils presently.

The most Accurate and Learned Dr. *Tyson* found in his *Anatomy of the Tazacu or Aperi Mexicanus*, several *Aneurismata* in the *Aorta* or great Artery, which it seems were natural, and which he never saw before in the Arteries of any other Animal: Tho' *Malpighius*, as he observes, took notice of such in the *Aorta* of Silk-worms.

ANGARIA, a Term in Law, signifying any troublesome or vexatious Duty or Service paid by the Tenant to the Lord.

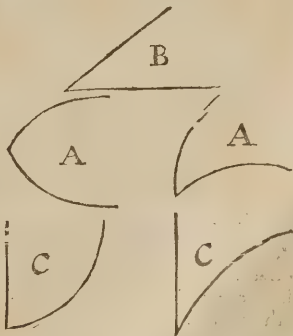
ANGLID, the bare single Valuation or Compensation of a Man or Thing, according to the legal Estimate, from the Saxon, *An* one, and *gild* Payment, Mulet, or Fine; so *Twigild* was the double Fine, *Trigild* the treble Fine, according to the rated Ability of the Person.

ANGIGLOSSUS, one that stuttureth, or hath a Difficulty in his Speech of pronouncing *L*, *R*, or *K*.

ANGINA, a *Quinsey* or *Squinancy*, is an Inflammation of the *Jaws* or *Throat*, attended with a continual Fever and Difficulty of Respiration and Swallowing; and it is two-fold, either *Spuria* or *Exquista*, a bastard or a true *Squinsey*: The latter is again four-fold, *Synanche*, *Parasynanche*, *Clynnache* and *Paraclynnache*, of all which in their proper Places. *Blanchard*.

ANGLE, in Geometry, is either *Plane* or *Solid*.

A *Plane Angle* is the Inclination, Aperture or Distance between two Lines meeting in a Point,

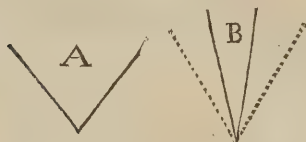


and which, when the Lines forming it (which are called

called its *Legs*) are *Right* or *Strait* ones, is called a *Right Lined* or *Rectilineal Angle*, as *B*; but when the *Legs* are crooked Lines, 'tis called a *Curvilineal Angle*, as *A*; and when one *Leg* is *strait* and the other crooked, 'tis called a *Mixed Angle*, as *C*.

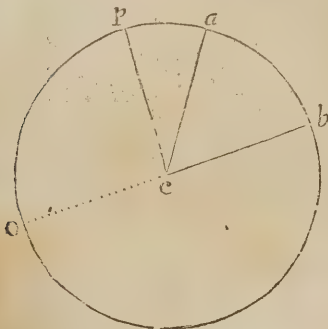
An *Angle* is usually marked with 3 Letters (especially if there be more *Angles* than one at the same Point) wherefore the middle Letter, which is always placed at the Angular Point where the Lines meet, denotes the *Angle*.

The *Quantity*, i.e. the *Greatness* or *Smallness* of an *Angle*, is by no means measured by the Length of its *Legs*, but by their *Distance* from, or *Inclination* to each other. Thus the *Angle B* is less than *A*, tho' the *Legs* of *B* are much longer than those of *A*, but then those of *B* are more inclined to each other, than the *Legs* of the *Angle A*. Which, to conceive the better, imagine



the *Angle A* to be laid upon *B*, as the prick'd Lines about *B* do represent; then 'tis plain, the *Angle B* will easily be contained within *A*; and therefore is less than *A*, because its *Legs* come nearer, or are more inclined towards each other, than those of *A*; and consequently *A* will be a greater *Angle* than *B*, because its *Legs* are farther distant from each other than the *Legs* of *B*. If you imagine the *Legs* to open and shut like those of a Joint Rule, or a Pair of Compasses, the thing will be very plain.

The *Quantity* of any *Angle* is measured by the Number of *Degrees* of the *Ark* of a Circle intercepted between the *Legs* of the *Angle*, whose



Center is the Angular Point. Thus the *Ark* *ab* is the Measure of the *Angle a c b*; and if that *Ark* contain 30 *Degrees*, the *Angle* is said to be an *Angle* of 30 *Degrees*.

A *RECTILINEAL ANGLE* is of 3 sorts.

1. *Right*, when one *Leg* of the *Angle* stands exactly upright, or perpendicularly on the other, as *p c* doth on *cb*; and inclines no more one way than it doth another. And such a *Right Angle* is said to be an *Angle* of 90 *Degrees*, because 'tis measured by an *Ark* that is the 4th part of a

Circle (as you see in the last Figure) and every Circle being supposed to have its whole Circumference divided into 360 Parts (which are called *Degrees*) the 4th Part of that is 90 *Degr.* and therefore a *Right Angle* contains 90 *Degr.*

2. An *Obtuse Angle*, as *a c o*, which exceeds or is bigger than a *Right* one, and is called *Obtuse*, because its Angular Point is blunt.

3. An *Acute Angle*, as *a c b*, which is less than a *Right* one, and is called *Acute*, because its Angular Point is sharp. No *Angle* can contain fully 180 *Degrees*, for then one *Leg* falls into the same *Right Line* with the other, and they make the *Diameter* of the Circle *o b*.

Angles also receive several other Denominations according to their several Positions, their Relation to the several Figures they are in, and the Lines that form them. Some are called

1. *Contiguous*, or *Adjacent Angles*, as *a* and *c*, *c* and *b*, *a* and *d*, &c. which have one *Leg* common to both *Angles*, and are both taken together, always equal to two *Right* ones; for if they are equal, the *Obtuse* one will be as much bigger than a *Right* one, as the *Acute* one is less; and therefore in the whole must make just two *Right*. 13 *e* 1 *Euclid*.

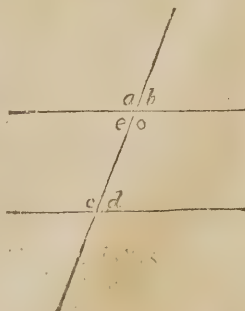
Cor. And from hence 'tis plain, that all the *Angles* that can be made about any Point, are equal but to four *Right* ones.

2. *Opposite* or *vertical Angles*, as, 1. Those that are made by two *Right Lines* crossing each other, and which touch only in their Angular Point. Thus the *Angles a* and *b*, or *c* and *d*, are called *Opposite* or *vertical Angles*, because they are opposed *ad Verticem*, or at the Head; and therefore in some Books are called *Head Angles*. These are always equal one to another, because each, with the *Contiguous* one, makes two *Right Angles*.

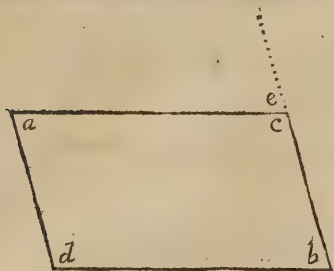
An *Angle* also in any *Triangle* is said to be *Opposite* to the Side that subtends it; as the *Angle a* is to the Side *B*. (Fig. *preced.*)

4. In any *Triangle*, as *a e f* (see the same Figure) the *Angle e* and *a* are called *Internal* and *Opposite*, in respect of the *External Angle f*, which is equal to them both.

5. If a *Line* cut two others that are Parallel, the *Angles c* and *d* are called *Internal* and *Opposite* also in reference to the *External* one *a* and *b*, to which they are severally equal.



6. The Angles a and b , as also c and d in every Rectangle or Parallelogram, are called the Opposite Angles; and are always equal to one another,



for the Angle a is equal to the Alternate one e , and e is equal to the Internal and Opposite one on the same Side b , wherefore a is equal to b ; and after the same manner may d and c be proved equal to each other.

ANGLE of Right Ascension, is the Angle which the Circle of the Star's Right Ascension maketh with the Meridian at the Pole of the World.

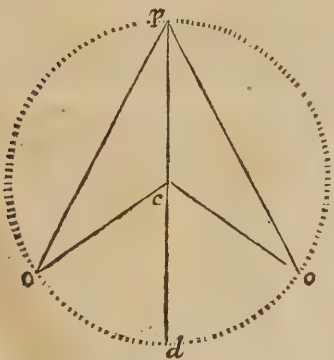
ANGLE at the Centre of a Circle, is an Angle made there by two Radius's which meet in the Centre.

Proposition.

If standing or insitting on the same Chord, or being in the same Segment, two Angles are formed, as ocd , opd , one at the Center, and the other at the Circumference: The Angle at the Center is always double of that at the Circumference. Of this there are three Varieties.

1. When one Leg of the Angle is the Diameter of the Circle, then 'tis plain the Angle at the Center ocd being external to the Triangle ocp , will be equal to $o + p$ (by 16 e 1. Eucl.) but $o = p$, because the Triangle is an *Isoceles* (5 e. 1.) wherefore $c = 2p$. Q. E. D.

Case 2.

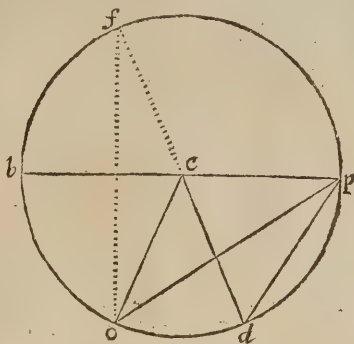


2. When the Diameter divides the two Angles, then 'tis plain, the whole Angle at the Center oco must be double to the whole Angle opo at the Circumference, because its Parts are severally double of the Parts of P (by the 1st Case.)

Case 3. When the Angles fall both on the same Side of the Diameter, then 'tis plain the whole External Angle bcd is $= 2cpd$, and the Part $bco = 2cpo$; wherefore the remaining part ocd , the Angle at the Center, must be double to opd , the Angle at the Circumference. Q. E. D.

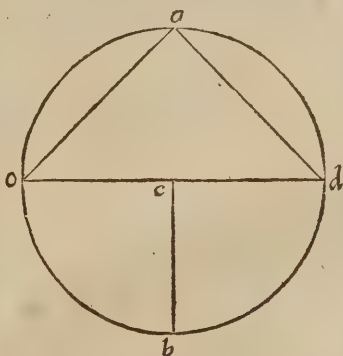
And hence are deducible the following Corollaries.

1. All Angles of d and opd standing on the same Ark, or being in the same Segment, are e-



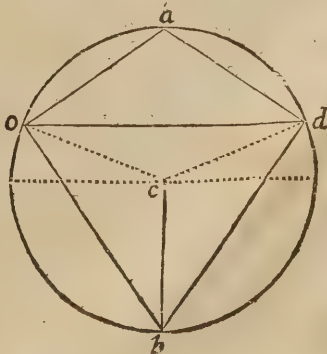
qual, because they are just the Halves of the Angle ocd at the Center.

2. Hence any Angle at the Center c standing on half the Ark ob must be equal to one at the Circumference a , which shall stand on od the whole Ark, or on the double of the former Ark.



3. And from hence 'tis plain, that every Angle in a Semi-circle, as a , must be a Right one, because 'tis equal to c at the Center, which stands on a Quadrant, and is a Right Angle.

4. Wherefore an Angle, as a , made in a Segment less than a Semi-circle, must be *Obtuse*, because 'tis equal to ocb , which is bigger than a Right one.

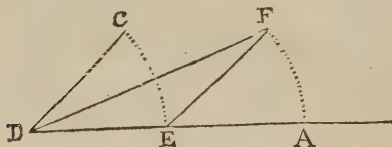


F 2

5. And

5: And consequently the Angle b made in the Segment $o b d$, which is greater than a Semi-circle, is *Acute*; for the Angle a of the Quadrilateral Figure $o a d b$ inscribed in a Circle, being *Obtuse*, b must needs be an *Acute* one, since the Sum of both is but 2Ls , (by $22\text{e}3$ Euclid.)

Hence may be drawn this Problem for the Bifsection of any Angle or Ark of a Circle; as suppose the Angle CDE , or the Ark CE .



Taking $EA = DE$, on the Center E , make the Ark $FA = CE$, and the Angle $FEA = CDE$, then draw DF , and that shall bisect the Ark CE , or the Angle CDE : For the Angle $FEA (= CDE)$ is double (because an Angle at the Center) to FDA an Angle at the Circumference.

ANGLE of or at the Center, in Fortification, is that which is made by the Concourse of two Lines drawn from the Angles of the Figure.

ANGLE at the Circumference of a Circle, is an Angle made by any two Chords which meet there in a Point.

ANGLE of the Circumference, in Fortification, is the mix'd Angle made by the Arch which is drawn from one Gorge to another.

ANGLE of the Counterscarp, is made by the two Sides of the Counterscarp meeting before the Middle of the Curtain.

ANGLE of the Curtain, or Angle of the Flank, is that which is made by or contained between the Curtain and the Flank in any Piece of Fortification.

ANGLE of the Complement of the Line of Defence, is the Angle proceeding from the Intersection of the two Complements one with another.

ANGLE DIMINISHED, in Fortification, is that which is made by the meeting of the outermost Sides of the Polygon, and the Face of the Bastion.

ANGLE of the Ecliptick with the Vertical Circle, or, as some call it, *Parallactick Angle*, is thus found; As the Tangent of \odot 's distance from *Aries*: Is to Rad :: So is the Tangent of his Declination: To the Co-sine of the *Parallactick Angle*.

ANGLE of Elevation: See Elevation.

ANGLE of the Exterior Figure, or The Angle of the Polygon, is that which is formed at the Point of the Bastion, by the meeting of the two outermost Sides or Bases of the Polygon.

ANGLE of the Interior Figure, in Fortification, is that which is made in the Center of the Bastion by the meeting of the innermost Sides of the Figure.

ANGLE FLANKING, is that which is made by the meeting of the two *Rasant* Lines of Defence, viz. the two Faces of the Bastion prolonged.

ANGLE flanking inward, is the Angle made by the Flanking-Line and the Curtain.

ANGLE FLANK'D, by some called the Angle

of the Bastion, in Fortification, is that which is made by the two Faces, being the utmost part of the Bastion most exposed to the Enemy's Batteries, and therefore by some is called the Point of the Bastion.

ANGLE forming the Flank, is that which consists of one Flank and one Demi-Gorge.

ANGLE forming the Face, in Fortification, is that which is composed by one Flank and one Face.

ANGLE of Incidence: See Incidence.

ANGLE of Inclination in Opticks: See Inclination.

ANGLE of Inclination of the Axis of the Earth to the Axis of the Ecliptick is $23^{\circ} 30'$, and remains inviolably the same in all Points of the Earth's Annual Orbit.

Mr. Keil in his Examination of Burnet's Theory of the Earth, hath shewn the great Wisdom of God in thus placing the Axis of the Earth Obliquely to the Plane of the Ecliptick; for by that means all those who live beyond 45° of Latitude, have more of the Sun's Heat, take all the Year round; and those who live within 45° have less than if the Earth moved always in the Equinoctial, P. 69, &c. And besides, 'tis the Oblique Position that causes all our Diversities of Seasons, and different Degrees of Heat and Cold.

ANGLE of Longitude, is the Angle which the Circle of a Star's Longitude maketh with the Meridian at the Pole of the Ecliptick.

ANGLE of the Meridian and Ecliptick, is found thus; As Rad: T , of the Sun's greatest Declination :: So is the Co-sine of his Longitude or Distance from *Aries*: To the Co-Tangent of the Angle sought.

ANGLE of the Meridian with the Horizon, is thus found; As the Co-sine of \odot 's Declination is to Rad :: So is the Co-sine of the Elevation of the Equinoctial: To the Sine of the Angle required.

ANGLE of the Moat, in Fortification, is that which is made before the Curtain, where it is intersected.

ANGLE of the Parallax: See Parallax.

ANGLE of the Interval of two Places, is the Angle made by the Lines directed from the Eye to those Places.

ANGLE of the Sun's Position, is the Angle made by the Intersection of the Ark of the Meridian Line, with an Ark of an Azimuth, or any other great Circle cutting thro' the Body of the Sun.

ANGLE of Reflection: See Reflection.

ANGLE of Refraction: See also Incidence.

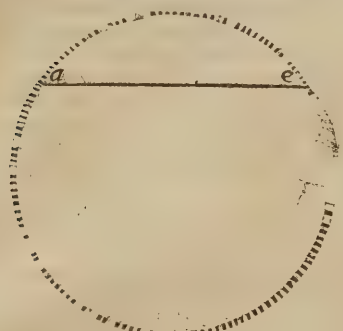
ANGLE of Refraction: See Refraction.

ANGLE Refracted, in Opticks, is the Angle between the Refracted Ray and the Perpendicular.

ANGLE RE-ENTRING, or Re-entrant Angle, in Fortification, is that which retires inward toward the Place.

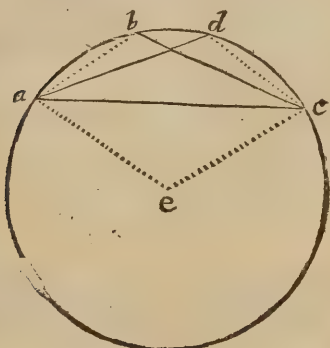
A N G

ANGLE of a Segment, is an Angle made by the Circumference, and a Right Line cutting it:



Thus here the two mix'd Angles, *a* and *e*, made by the Chord, and the Ark, are called Angles of a Segment.

ANGLE in a Segment, is an Angle made by two Right Lines rising from the Angles of the Segment, and meeting in the Circumference: Thus



the Angle *abc* inscribing or standing on the Chord *ae*, and having its Vertex in the Circumference of the Circle, is called an Angle in the Segment *abc*.

Proposition.

All Angles in the same Segment, or standing on the same or equal Arches or Chords, are equal, because they are just the Halves of the Angles at the Center standing on the same Ark. See Angles of the Center.

ANGLE SAILANT, is that which advances its Point towards the Field. This is called *Soriant* or *Viff*.

ANGLE of the Sun's apparent Semi-Diameter in his nearest Distance to the Earth; Bullialdus found it by two Observations to be 16 min. 45 sec. And the Semi-diameter of the Moon he found to be 16 min. 54 sec. And the Semi-diameter of the Earth's Shadow he found in an Eclipse of the Moon to be 44 min. 9 sec.

ANGLE SPHERICAL, is made on the Surface of the Globe or Sphere by the Interfection of two Arks of great Circles.

ANGLE of the Shoulder, in Fortification, is that which is constituted by the Lines of the Face and Flank.

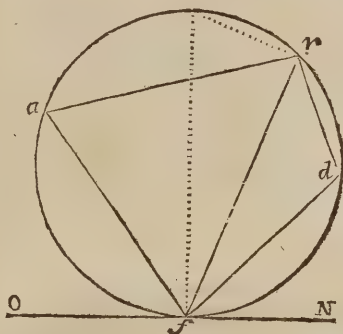
ANGLE SOLID: See Solid Angle.

A N G

ANGLE made by a Tangent to a Circle and any Chord drawn from the same Point of Contact, is equal to any Angle that can be made in the opposite Segment, 32. e. 3. Euclid.

I say, $\angle rfn = \angle a$.

Draw the Diameter *bf*, and also the Line *br*.



Demonstration.

Because *fb* is a Diameter, the Angle *brf* is a Right Angle; wherefore the Angles *b* and *bfr* together must be equal to a Right Angle.

Also, *bfr* and *rfn* = \angle , because *fn* is a Tangent; therefore take away *bfr* which is common to both, and $\angle b = rfn$.

But the $\angle b = \angle a$, because in the same Segment, wherefore $\angle a = \angle rfn$. Q. E. D.

Also, I say, $\angle ofr = \angle d$.

Demonstration.

The $\angle ofr + rfn = 2 \angle$

And $\angle d + \angle rfd + \angle frd = 2 \angle$

But $\angle rfn = rfd + frd$.

Therefore taking away *rfn* from both, the $\angle d$, will remain equal to the $\angle ofr$. Q. E. D.

Corollary.

Hence 'tis plain, That the opposite Angles (*d* and *a*) of any Quadrilateral Figure inscribed in a Circle, are equal to two Right Angles.

For $d + a = ofr + rfn = 2 \angle$ s.

ANGLE of the Tenaille, or the outward Flanking Angle, called also Angle Mort or the Dead Angle, Angle Reentrant or Angle Inwards; is made by the two Lines Eschant, in the Faces of the two Bastions extended till they meet in an Angle towards the Curtain; and is that which always carries its Point in towards the Work.

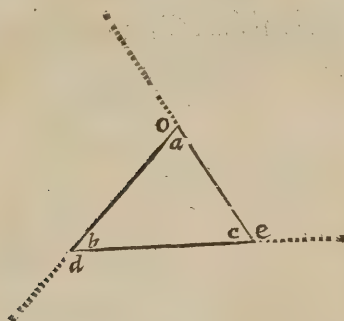
ANGLE of the Triangle, in Fortification, is half of the Angle of a Polygon.

ANGLES ALTERNATE, are *o* and *c*, as also *e* and *d* in Figure, N. 5. and are always equal to one another. See 3 Pages back.

ANGLES of a Battalion, are made by the last Men at the ends of the Ranks and Files: And two last Men of the Front and Rear Ranks, are called { Front and } Angles.
Rear

ANGLES EXTERNAL, are the Angles of any Right Lined Figure without it, when all the Sides are severally produced; and they are all taken together, equal to 4 Right Angles: And, in particular, of a Triangle the External Angle *e* is equal

equal to both the Internal and Opposite ones *a* and *b*. See the Demonstration of which under Triangle.



And as to the former part, that the Sum of the External Angles of any Plane Figure is \equiv to 4 \angle s, is plain from hence; that the Sum of all the Angles of any Right-lined Figure both Internal and External, must be \equiv to twice as many \angle s as the Figure hath Sides, (by 13. e. 1. Euclid.) But the Internal ones are \equiv to twice as many \angle s as the Figure hath Sides, except 4. (by Theor. 1. Prop. 32. e. 1. Barrow's Euclid.) wherefore the External Angles all together must be equal to those 4 Right ones.

ANGLES INTERNAL, in general, are all Angles made by the Sides of any Right-lined Figure within. Also the two Angles between the Parallel Lines on each Side the crossing Line, as *o* and *d*, *e* and *c* (in Fig. 5.) are called the two Internal Angles; and are always equal to two Right ones. The Angles *c* and *d* (see Fig. 5.) are also called Internal and Opposite Angles in respect of *a* and *b*, as hath been lately said.

The Sum of all the Internal Angles of any Right-lined Figure, is equal to twice as many Right Angles as the Figure hath Sides, except 4. For since every such Figure from a Point taken within it, can be divided into as many Triangles as it hath Sides, and since the Sum of the Angles of each Triangle is equal to 2 \angle s (32. e. 1. Euclid.) That will make twice as many \angle s as the Figure hath Sides; from which

Sum you must take away all those Angles which are about the Point *c*, which (by 13. e. 1. Euclid.) are equal to 4 \angle s; wherefore the remaining Sum of all the Internal Angles is equal to twice as many Right Angles as the Figure hath Sides, except 4. Q. E. D.

ANGLES OBLIQUE, are such as are either Obtuse or Acute, in opposition to Right Angles.

ANGULAR, is that which relates to or hath Angles.

ANHELATION, a Difficulty in fetching one's Breath.

ANHELOTE, a Term in Law, signifying that every one should pay according to the Custom of the Country, his respective Part and Share.

ANIENTE, a Law Term, signifies frustrated or made void.

ANIMADVERSION, sometimes signifies Correction, sometimes Remarks or Observations made on a Book, &c. and sometimes serious Consideration and Reflection on any Point.

ANIMATION, is informing an Animal Body with a Soul; thus the *Fœtus* in the Womb is said to come to its Animation, when it begins to act like a true Animal, or after the Female that bears it is Quick, as the common way of Expression is.

ANIMA HEPATIS, is *Vitriolum* or *Sal Martis*, Vitriol or Salt of Steel, according to some Chymists.

ANIMA SATURNI, signifies (with some Chymists) the Extract of Lead.

ANIMALS, are such Beings, which, besides the Power of growing, encreasing and producing their Like, as Plants and Vegetables have, are endowed also with Sensation and Spontaneous Motion.

For the more easie and clear Comprehension and Distinction of the several kinds of Animals, Mr. Ray gives two Schemes or Tables of them: The first a general one of all Animals; the second a particular one of Quadrupeds.

Animals are either

- Sanguineous, that is, such as have Blood, which breath either by
 - Lungs, having either
 - Two Ventricles in their Heart, and those either
 - Viviparous.
 - Aquatick, as the Whale-kind.
 - Terrestrial, as Quadrupeds.
 - Oviparous, as Birds.
 - But one Ventricle in the Heart, as Frogs, Tortoises and Serpents.
 - Gills, as all Sanguineous Fishes except the Whale-kind.
 - Exanguineous, or without Blood, which may be divided into
 - Greater, and those either,
 - Naked
 - Terrestrial, as naked Snails,
 - Aquatick, as the Poulp, Cuttle-Fish, &c.
 - Covered with a Tegument, either,
 - Crustaceous, as Lobsters and Crab-fish.
 - Testaceous, either,
 - Univalve, as Limpets.
 - Bivalve, as Oysters, Muscles, Cockles.
 - Turbinate, as Periwinkles, Snails, &c.
 - Lesser, as Insects of all sorts.
- Viviparous Hairy Animals or Quadrupeds, are either
 - Hoof'd, which are either,
 - Whole-footed or Hoof'd, as the Horse and As.
 - Cloven-footed, having the Hoof divided into
 - Two principal Parts, called Bifcula, either
 - Such as chew not the Cud, as Swine.
 - Ruminant, or such as chew the Cud, divided into
 - Such as have perpetual and hollow Horns,
 - Beef-kind,
 - Sheep-kind,
 - Goat-kind,
 - Such as have solid, branched, and deciduous Horns, as the Deer-kind.
 - Four parts, or Quadrisfulca, as the Rhinoceros and Hippopotamus.
 - Claw'd or Digitate, having the Foot divided into

Two Parts or Toes, having two Nails, as the Camel-kind.

Many Toes or Claws; either

Undivided, as the Elephant.

Divided, which have either

Broad Nails, and an Human Shape, as Apes.

Narrower, and more pointed Nails, which in respect of their Teeth, are divided into such as have

many Fore-teeth or Cutters in each Jaw;

The Greater, which have

A shorter Snout and rounder Head, as the Cut-kind;

A longer Snout and Head, as the Dog-kind.

The Lesser, the Vermin or Weasle-kind.

Only two large and remarkable Fore-teeth, all which are Phytivorous, and are called the Hare-kind.

ANIMALCULA, are very small Animals, such as by the Microscope have been discovered in most Fluids, of which there are prodigious Numbers in Black-Pepper Water, and as I have often seen also in Water wherein Barley, Oats, and especially Wheat, hath been steeped for about 4 or 5 Days.

ANIMATED MERCURY; so Mr. Boyle calls a Mercury, which by being impregnated with some Subtile, Agile and Spirituous Particles, is rendered capable of growing hot when mingled with Gold; and such also he calls *Incalescent Mercuries*.

ANIMATED NEEDLE, is one touch'd with a Load-stone.

ANI SCALPTORIS MUSCULIPAR, is the Muscle called also *Latissimus Dorsi*, from its largeness; its Use is to draw the Arm backward and downward, and therefore is called *Ani Scalptor*, because it helps to scratch the Breech.



ANKRED, so the Heralds call one of their Crosses in a Coat of Arms, whose Figure is this.

ANNALS, are a Chronological Account of the Remarkable Events of a State, yearly, as the Annals of Tacitus: they differ from History, because this descants upon those Events, and on the Causes that produced them. The Writer of such an History is called an *Annalist*.

ANNATES, (a Law Term) signifying the same with *First-Fruits*: The Reason of the Name is, because the Rate of *First-Fruits* paid to Spiritual Livings, is after the Value of one Year's Profit.

ANNIENTED, a Term in Law, signifying as much as frustrated or brought to nought.

ANNIHILATION, is the destroying utterly, or turning of any created Being into nothing.

ANNUA PENSIONE, is a Writ whereby the King having due unto him an Annual Pension from an Abbot or Prior, for any of his Chaplains (whom he should think fit to nominate, being as yet unprovided of sufficient Liberty) did demand the same of the Abbot or Prior; and also willed him, for his Chaplain's better Assurance, to give him his Letters Patent for the same.

ANNUAL EQUATION, or mean Motion of the Luminaries: See *Equation*.

ANNUALIA, formerly a Yearly Stipend assign'd to a Priest, for keeping the Anniversary, or

otherwise for saying continued *Masses* one Year, for the Soul of the deceased Person.

ANNUATES MUSCULI, a pair of Muscles at the Root of the Transverse Vertebra of the Back, described by Mr. Couper, and called by him *Recti Interni Minores*, because they lie under the *Recti Majores*; and he thinks they may very properly have this Name of *Annuates*, because they serve to nod the Head directly forward.

ANNUITY, is a Yearly Rent to be paid for Term of Life, or Years, or in Fee: In Common-Law, the Difference between a Rent and an Annuity is this, That Rent is payable out of Land, Annuity charges only the Person of the Grantor. For the Valuation of *Annuities*: See *Interest*.

An Annuity cannot be taken for *Affees*, because 'tis no Freehold in Law; nor can it be put in Execution on a Statute Merchant, Statute Staple, or Elegit, as a Rent may.

ANNULAR CARTILAGE, the second Gristle of the Larynx, which is encompassed by it, as it were with a Ring.

ANNULARIS PROCESSUS, is a Protuberance made by the meeting of the Processes of the *Medulla Oblongata*, under the Side thereof.

ANNULET, a little Ring, which in Heraldry is the Mark of Distinction which the Fifth Brother of any Family ought to bear in his Coat of Arms. *Anulets* are also part of the Coat-Armour of several good Families.

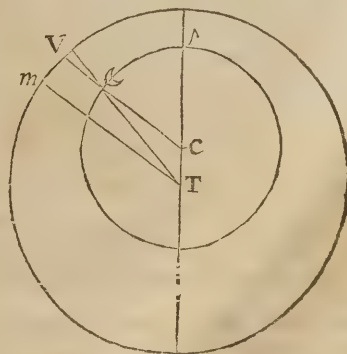


ANNULETS, in Architecture, are small square Parts turned about in the Corinthian Capital, under the *Echinus* or Quarter-round.

ANNULAR PROTUBERANCE, is with the Anatomists a certain part of an Human Brain lying between the *Cerebellum* and the two backward Prominences. The same with the *Annularis Processus*.

ANODYNES, (in Medicine) are such Remedies as alleviate or quite take away Pain. They are sometimes also called *Paragoricks*, from the Comfort and Quiet that they procure to the Patient: If they are of such a Nature as to produce Sleep, they are called *Hypnoticks*; if they stupify and take away the Sense of Pain, they are called *Narcoticks*.

ANOMALY, is an Inequality or Irregularity in the Motion of the Planets. In *Phil. Trans.* N. 57. you have a way to find it Geometrically



by Mr. *Cassini*. The Word *Anomaly* is sometimes used to signify the *Argument* of the Irregularity, and the *Equation* which should adjust it. This Irregularity is most considerable in the *Moon's* Motion, and it must be adjusted before the exact time of her Conjunction with the Sun can be found, and consequently an Eclipse truly calculated.

The Angle ACQ , or its equal ATM , is the *Argument* or the *Mean Anomaly* of the *Moon*; and the Angle ATQ is the *True* or *Co-adequated Anomaly*: See *Mercator's Astronomy*, P. 69.

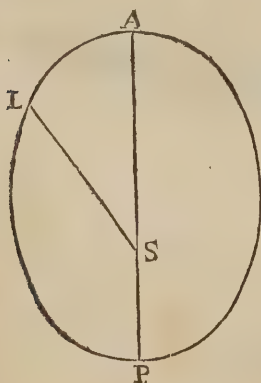
ANOMALY of the Orbit, is the Arch or Distance of a Planet from its *Aphelion*. The *Mean*

ANOMALY of the Center, in the *Ptolemaick Theory* of the Planets, is an Ark of the *Zodiack* of the *Primum Mobile* terminated by the *Linea Apfidiom*, and by the Line of the *Mean Motion* of the Center. The *True*

ANOMALY of the Center, is the same Ark of the *Zodiack* terminated by the Lines of the *Apses*, and by the Line of the *True Motion* of the Center.

ANOMALY (true or equal) of a Planet, is an Ark of the Eccentric comprehended between the true Place and the *Apogee*.

ANOMALY, *Mean* or *Equable* of a Planet in the *New* or *Elliptical Astronomy*, is the Area contained under the Line SL drawn from the Sun to the Planet, under SA and LA , computed from SA , in *Consequentia*, or according to the Natural Order of the Signs. They call it the *Equable*, *Mean* or *Middle Anomaly*, because this Area increases equally, or in Proportion to the Time of the Planets Revolution round the Sun in the Focus S .



The Angle ASL under the Line of the *Apses* AP , and the Line LS , which is that of the Planets Motion, is called the *Anomaly Co-equated*, or *True*, in this *Astronomy*.

ANOMALY, (*Mean*) of the Sun or other Planet, in the old *Astronomy*, is an Ark of the *Ecliptick* between its mean Place and *Apogee*. This is call'd the *Argument*.

ANOMALY, is also used by the Grammarians, and is apply'd to such Words as do not in their Formation or Variation, agree with a common Rule; as *do*, *dedi*, *datum*, where the *Imperfect Tense* and the *Participle* are both *Anomalous*, that is, *Irregular*.

They reckon 4 kinds of *Anomalous Nouns*, *Heterogeneous*, *Heteroclitcs*, *Deficients*, and *Redundants* or *Abundants*, which see.

ANOMALOUS, is the same with *Irregular*, and is spoken of a Motion in the Planets that is Unequal or Irregular.

ANONYMOUS, *Nameless*, to which no Name is affixed. Mr. Boyle finding by Experiment, that a Spirit was separable from *Tartar*, and several Woods, which in many Qualities differed both from the *Vinous*, *Acids*, and *Urinous ones*, and having not fully discovered its Nature, he called it by this Name *Anonymous*, and sometimes the *Neutral* or *Adiaphorous Spirit* of *Tartar*, *Wood*, &c.

ANOPSY, is want of Sight, or Blindness.

ANOREXY, is a loathing of Meat, arising from an ill Disposition of the Stomach.

ANOYANCE, the same with *Nuisance*.

ANSES or **ANSE**, the same with the Ring of Saturn; so called, because they sometimes appear like Handles to the Body of the Planet. See *Ring*. Anno 1668, August 17th, 11 h. 13m. P. M. Mr. *Hugens* and Mr. *Picart*, by the Help of a 21 Foot Telescope, found the Inclination of the great Diameter of the Ring of Saturn, with the *Equator*, to be about 9 Degrees; whence they inferred, the Angle of the Plane of the Ring, with that of the *Ecliptick*, must be about 21 Deg. See *Saturn*.

ANTAGONIST, he that in Disputation, or Arguing opposes another.

ANTAGONISTA, is a Muscle placed oppositely to another; as may be seen betwixt the *Adductor* and *Abductor*, that which contracts, and that which expands the Arm.

ANTANACLASIS, a Figure in Rhetorick, where the same Word in appearance is repeated in a various Signification.

ANTAPHRODITICK MEDICINES, are such as are used for the *French Pox*.

ANTARES, the *Scorpion's Heart*, a fix'd Star of the first Magnitude in the Constellation *Scorpio*; its Longitude is 245. 13'. Latitude 4°. 27'.

ANTARTICK POLE, is the Southern Pole, or End of the Earth's *Axis*; 'tis so called because opposite to the *Arctic* or North Pole.

ANTARTICK CIRCLES: See *Polar Circles*.

ANTARTHRITICK MEDICINES, are such as are used against the Gout.

ANTASTHMATICK MEDICINES, are such as are used against the *Asthma*.

ANTECEDENCE IN, or in *Antecedentia*: The Astronomers say, a Planet is in *Antecedence*, when it appears to move contrary to the usual Course or Order of the Signs of the *Zodiack*, as when it moves from *Taurus* towards *Aries*, &c. but if it go from *Aries* to *Taurus*, and thence to *Gemini*, &c. they say, it goes in *Consequentia*, or in *Consequence*.

ANTECEDENT, (in Logic) is the first of the two Propositions in an *Enthymema*, as the latter is called the *Consequent*.

ANTECEDENT, in Mathematics, is the former of two Terms in Proportion, or that which is compared with the other; thus, if the Proportion were of A to B , A is said to be the *Antecedent*.

ANTEMETICKS, are Medicines given against Vomiting.

ANTES, in Architecture, are square Pilasters which the Ancients used to place at the Corners of the Walls of their Temples.

ANTESTATURE, is a small Retrenchment made of *Palisadoes*, or Sacks of Earth set up in haste to dispute with the Enemy the remainder of a

Piece

piece of Ground, part whereof hath been already gained.

ANTHELIX, is the Protuberance of the Ear, or the inward Brink of the outward Ear, being a Semicircle within the *Helix*, and almost parallel to it.

ANTHELMINTICKS, are such Medicines as destroy Worms.

ANTHERÆ, are those little Tops or Knobs which grow on the Tops of the *Stamina* of Flowers, and are often called *Apices*: which see. Mr. Ray Englishes them *Chives*.

ANTHOLOGY, is a Discourse or a Treatise of Flowers, or the Art of a true Florist.

ANTHRACOSIS OCULI, is a corrosive scaly Ulcer in the Eye, attended with a general Tumour, especially of the Parts about the Eye.

ANTHRAX, *Carbo*, *Pruna*, or *Carbunculus*, is defined to be a Tumour that arises in several places surrounded with hot, fiery, and most sharp Pimples, accompanied with acute Pains, but without ever being separated; and when it spreads it self farther, it burns the Flesh, throws off Lobes when it is rotten, and leaves an Ulcer behind it, as if it had been burnt in with an Iron. *Blanchard*.

ANTIAS, in the plural *Antiaes*, are the Glands called the *Tonfills* or the Almonds of the Ears.

ANTIAPHRODITICKS, are Medicines that lay Lust.

ANTIARTHRITICKS, are Medicines against the Gout.

ANTIASMATICKS, Remedies against shortness of Breath.

ANTIBACHIUS, is a Latin Verse whose Feet consists of three Syllables, the two first long, and the last short.

ANTICARDIUM, the same with *Scrobiculus Cordis*.

ANTICTHONES, the same with *Antipodes*.

ANTICKS, in Architecture, are certain carved Works representing divers odd Shapes of Men, Beasts, Birds, Fishes, Flowers, *etc.* which being rudely determin'd and form'd one out of another, serve as an Ornament to the whole Fabrick, and afford a grateful Variety to the Eye of the Beholder.

ANTIDILUVIAN, is whatever was before Noah's Flood: Thus those Generations from *Adam* which were before the Flood, are called the *Antidiluvians*, as those since descended from Noah are called the *Post Diluvians*. The Earth that then was before it was destroyed by the Flood, and which the ingenious and learned Dr. *Tho. Burnet* conceives to have been very different from ours in Form, Constitution, Figure and Situation, is called the *Antidiluvian Earth*.

But Dr. *Woodward* in his *Natural History of the Earth*, undertakes to prove from a Series of Observations carefully made,

1. That the Face of the Earth before the Deluge was not as the Theorist imagines, *Smooth, Even, and Uniform*, but as it is now, *Unequal, distinguished into Mountains, Valleys and Plains*, as also having a Sea, Lakes and Rivers.

2. That this Sea was Salt as ours is, agitated by Tides replenished with Fishes of all kinds, and that the Ocean then was nearly of the same Extent, and possess'd an equal share of the Globe with the present one.

3. That the *Antidiluvian Earth* was stock'd with Vegetables and Animals on all sides and in all Parts of it quite round the Globe; had both Metals and Minerals in it; had the same Position in respect of the *Sun* which ours now hath, its *Axis* being not parallel, but inclin'd as at present, to the Plane of the *Ecliptick*; and consequently there were then the same Succession of Heat and Cold, Wet and Dry, and the same Vicissitudes of Seasons, *Spring, Summer, Autumn and Winter*, as there are now.

ANTIDOTE, a Medicine against deadly Poison.

ANTIEPILEPTICKS, are Remedies against the Falling sickness.

ANTIEMETICKS, Remedies that stop Vomiting.

ANTI-HECTICUM POTERII, or *Jupiter's Diaphoretick*, is a Chymical Medicine made by the Mixture of *Tin*, the Martial Regulus of *Antimony*, and fixed by *Salt-Petre*. See the Operation in *Lemmer's Chymistry*, last Edit. p. 117.

ANTHYPNOTICKS, Medicines that drive away Sleep.

ANTI-HYPOCHONDRIACKS, are Medicines used against the *Hypochondriack Melancholly*.

ANTI-LOGARITHM, the Complement of the Logarithm of any *Sine, Tangent, or Secant* to 90. *De*.

ANTI-LOGY, is a Contradiction between any Words or Passages in any Author.

ANTI-METRICAL, is whatever is contrary to the Nature and Order of Metre or Verse.

ANTIMONIUM DIAPHORETICUM, is made of one part of *Antimony* and 3 of *Salt-Petre*, powdered and mixed together, and thrown Spoonful by Spoonful into a red hot Crucible, a Detonation will follow each Spoonful; when all is put in, continue a great Fire about the Crucible for about two Hours; then throw the white Matter into an Earthen Vessel of fair Water, and leave it steeping warm for about two Hours, that all the *Salt-Petre* may be dissolved; then pour off the Liquor gently, and wash several time the white Powder at the Bottom; which is the *Calx of Antimony*, or *Antimonium Diaphoreticum*. Some use it as a *Diaphoretick*; but *Lemmer* saith, he could never find it would raise a Sweat.

ANTIMONIUM MEDICAMENTOSUM, is a Preparation consisting of 5 Ounces of *Antimony*, 1 Ounce of *Salt of Tartar*, and 4 Ounces of *Salt-Petre* fluxed together into a *Regulus*, which is afterwards powdered and wash'd.

ANTIMONIUM RESUSCITATUM, is made of equal parts of *Antimony* and *Salt Armoniac* sublimed together three times; then the Sublimate is wash'd with distill'd *Vinegar* warm to get out the Salts.

ANTINEPHRITICK, is a Medicine good against the Stone.

ANTINOMASY, is a Figure in Grammar, or rather Rhetorick, whereby an Appellative is used instead of a proper Name; as the *Philosopher* instead of *Aristotle*, &c. and whatever is thus delivered or spoken, is said to be so delivered or spoken *Antonomastically*.

ANTINOMY, is a Contradiction between two Laws.

ANTIÆCI, are such Inhabitants of the Earth as dwell one against another in the same Semicircle of the same Meridian, and in the same De-

gree of Latitude, but one North, the other South. These have Noon and Midnight at the same time, but the Seasons of the Year are contrary; as when the Northern *Antiaci* have their Summer, the Southern have Winter, &c. In one Word, they live under the same Meridian, but opposite Parallels.

ANTIPAGMENTS, (in *Architecture*) are the Garnishing of Posts or Pillars.

ANTIPASIS, the same with the *Revulsion* of a Disease, when the Humours flowing into some one Part, are turned back again, and forced to take some other Course.

ANTIPERISTASIS, according to the *Peripatetics*, is a certain Invigoration of the Internal Heat of any Body, by its being invironed all round with Cold. They instance in Lime growing hot on the Effusion of cold Water, &c.

ANTIPERISTALTICK, is a Motion by which the Excrements of the Guts are carried upwards instead of downwards, which is the usual and natural *Peristaltick Motion*. See that Word.

ANTIPHARMACUM, the same with *Antidote*, is a Medicine that expels Poison.

ANTIPHHRASIS, a figurative Speech, having a contrary Meaning to what it carries in Appearance.

ANTIPILEPTICKS, are Medicines against the Falling-Sickness.

ANTIPODES, are such Inhabitants of the Earth as live diametrically opposite to one another, that is, in Parallels of Latitude equally distant from the Equator, but one North, the other South; and under the same Meridian, though 180°. or just half of that Meridian distant from one another.

ANTIPRÆDICAMENTS, in Logick, are such Notions as are previously necessary to understand the Doctrine of the Prædicaments; such as the Definitions of Univocal, Equivocal, and Denominative Terms, &c.

ANTIPTOSIS, a Figure in Grammar, wherein in one Case is put for another.

ANTISCH, is a Term in Geography, signifying such Inhabitants of the Earth as live in two Places opposite to one another, one on the North, the other on the South Side of the *Æquator*; so that their Shadows at Noon fall different ways, one directly opposite to the other.

ANTISCORBUTICK, are Medicines against the Scurvy.

ANTISTROPHE, is a Figure in Grammar, whereby two Terms of Things which are mutually independant one upon another, or reciprocally converted; as if one should say, the Master of the Servant, and the Servant of the Master.

ANTISPASMODICKS, are Remedies against Convulsions.

ANTITHENAR, one of the Muscles that extends the Thumb.

ANTITHESIS, in Rhetorick, is a setting two things by way of Opposition one against another, that is the Excellence of one, and the Evil and the Folly of the other may the better appear.

ANTITRAGUS, a little Prominence at the lower end of the *Antihelix*, seated opposite to the *Tragus*, whence it has its Name.

ANTÆCI, the same with *Antiaci*, which see.

ANTONOMASIA, (a Trope in Rhetorick) is when the proper Name of one thing is applied

to several others; or on the contrary, the Name of several things to one.

By this Trope we call any voluptuous Person a *Sardanapalus*, and any cruel Person a *Nero*, for the one was a voluptuous King, and the other a cruel Emperor; Or when we say, the Philosopher has prov'd it in his *Metaphysics*; The Orator gives this Precept in his *Rhetorick*; we mean *Aristotle* and *Cicero*.

ANUS, is the Extremity of the *Intestinum Rectum*; it consists of three Muscles, two called the *Levatores*, which distend and open the *Anus* in order to discharge the Excrements; and one called the *Sphincter*, which shuts it and keeps it so. There is also a Cavity in the Brain called *Anus*, which arises from the four Trunks of the *Spinal Marrow*; and by some the Skin which goes over the Navel, in aged Persons becoming wrinkled, is called *Anus*.

AORTA, or great Artery, so called because it is the greatest Artery in the whole Body, from which all others (except the *Pulmonary*) are deriv'd: It rises immediately out of the left Ventricle of the Heart, and at its rise hath three Valves, which have the same Use and Figure as the *Semilunares* in the *Arteria Pulmonaria*. As soon as the *Aorta* comes out of the Heart, it ascends a little upwards, and then turns downwards to form the descending Trunk, because the Blood might offend the Brain, if it ran with that impetuosity with which it's thrown out of the Heart; and from the upper side of this turning, the *Cervical* and *Auxillary* Vessels do arise: By this Artifice, as the Blood collides against the sides of the *Aorta*, its force is broken, part of it is taken in by the Mouth of the ascending Branches, but its greatest part is directed downwards. At the rise of the *Coronaria* out of the *Aorta*, there is a Valve placed that permits the Blood to flow out of the great Artery into them, but hinders its reflux. When it has pierced the *Pericardium* and bended a little Arch-ways backwards, it is divided into two Trunks, whereof the one is called *Truncus Ascendens*, the other *Descendens*.

The *Aorta* hath four Tunicks, a Nervous, a Glandulous, a Muscular, and a Membranous one, which is the Internal. See *Arteries*.

APAGOGICAL DEMONSTRATIONS, are such as do not prove the thing directly; but shew the impossibility and absurdity which arises from denying it, and therefore 'tis usually called *Reductio ad impossibile, vel ad Absurdum*.

APATHY, is an utter want of Passion.

APEPSIE, bad Digestion or rawness of Stomach, when there is no good Concoction of the Aliments.

APERIENS PALPEBRAM RECTUS, is a Muscle so called from its freight Progress and Use. It arises sharp and fleshy from the profoundest Part of the *Orbis*, near the Place where the Optick Nerve is transmitted, passing directly over the *Musculus Atrolens*, it becomes Tendinous as it marches over the Bulb of the Eye, whence growing still broader and thinner, till it is inserted to the whole superior part of the upper Eyelid.

APERITIVE MEDICINES, or such as open the obstructed Passages in the small Vessels, Glands or Pores, and by that means promote a due Circulation of the contained Juices.

APERTURA FEUDI, a Term in the Civil Law, signifying the loss of a Feudal Tenure by Default

Default of Issue of him to whom the *Feud* was first granted or given.

APERTURE, in some Writers of Geometry is the Inclination of one Right Line to another, which meet in a Point and form an Angle. And 'tis so called, because the Angle is the *opening* of the Legs of the Angle, like those of a Joint Rule.

APERTURE, in Opticks, is the Hole next to the Object Glass of a Telescope or Microscope, thro' which the Light and Image of the Object comes into the Tube, and thence is carried to the Eye. Mr. *Auzout* saith, he found that the *Apertures* of Telescopes, ought to be nearly in a Subduplicate Proportion of their Lengths.

The visible *Area* of an Object, is not encreased or diminished by the greater or lesser *Aperture* of the Object Glass; all that is effected thereby, is the admittance of more or less Rays, and consequently the more bright or obscure appearance of the Object. When you look at *Venus* thro' a Telescope, you must use a much less *Aperture* than for the *Moon*, *Jupiter* or *Saturn*, because her Light is so vivid and glaring.

APETALOUS Flowers or Plants, are by the Botanists accounted such as want the fine coloured Leaves of Flowers which they call *Petala*: These Flowers are otherwise called *Stamineous*, and are justly reckoned *Imperfect*.

APEX, is the top, point, uppermost or sharpest part of any thing.

APHÆRESIS, in Grammar, is that Figure which takes away a Letter or a Syllable from the beginning of a Word.

In Surgery, is that part which teaches to take away Superfluities.

APHELIUM, or *Apelton*, or *Auge* in the *Copernican Hypothesis*, is that point of the Earth's or any other Planet's Orbit, in which it is the farthest distant from the *Sun* that it can ever be; and when 'tis at its nearest distance, it is said to be in its *Perihelion*.

Sir *Isaac Newton* proves the *Apheia* of the Planets as well as the Nodes to be at rest, *Prop. 14. Book 3.*

In *Philos. Trans. N. 128.* is a strict Geometrical Method for finding the *Apheia* of the Planets by Mr. *Halley*.

APHORISM, is in a general Rule, or eminent but short Observation, experienced for a Truth in any Art, or relating to Practice.

APHTHÆ, are Wheals, Ulcers or Pimples about the Internal Parts of the Mouth; as also about the Ventricle and Guts, which when they come to be ripe, fall off by piece-meal, and are often accompanied with a Fever in those of riper Years. Infants are often subject to the *Aphthæ*, they begin in the Gums, and by degrees spread over the whole Palate and Mouth; if they seize the Epiglottis and the upper parts of the Throat, the Child seldom recovers. These are called *Aphthæ* of *Celsus*.

APICES, of a Flower, are those little Knobs that grow on the Tops of the *Stamina*, in the middle of the Flower: They are commonly of a dark purplish Colour. By the Microscope they have been discovered to be, as it were, a sort of *Capsule Seminales* or *Seed Vessels*; containing in them small Globular, and often Oval Particles, of various Colours, and exquisitely formed, as I have often with Admiration observed my self: In the Plant called *Germanium Robertianum* or *Herb Robert*, these *Apices* are of a deep purple Colour,

and the Pulvicular Matter within of a glorious Yellow; they are exquisitely Spherical, and afford a very pleasant Prospect in the Glass.

What the Use of these so finely elaborated Particles is, is not yet, that I know of, discovered: Some have guessed it to be a kind of *Male-Sperm*, which falling down into the Flower, they will have to help, fecundate and ripen the Seed; but this I take to be a meer Fancy.

APNOEA, a Depravation and Diminution, or an entire Suppression of Breathing, at least to Sense, as it happens in Swoonings, Fits of the Mother, and Strong Apoplexies.

APOCHYLISMA, is any Juice boiled and thickened with Honey or Sugar into a kind of hard Consistence. This is called also *Rob. Rubab*, and *Succago*.

APOCOPE, a Figure in Grammar, wherein the last Letter of a Word or Syllable is cut off.

APOCROUSTICKS, are (according to some Physicians) such Medicines as hinder the Influx of the Humours to any particular part of the Body, and reject those which are beginning to flow thither.

APODICTICAL Argument or *Syllogism*, signifies a plain Proof or Demonstration of a thing.

APODICTICK, the same with *Apodictical*.

APODIOXIS, a Figure in Rhetorick, wherein any Argument or Objection is with Indignation rejected as absurd.

APOGEE or **APOGÆUM**, in Astronomy, is the farthest distance that any Planet can be at from the Earth in its whole Revolution; as *Perigeum* is its nearest distance.

How to find both *Apogæum* and *Perigeum*, see the Geometrical Method of *Cassini*, with some Considerations upon it by Mr. *Mercator*, in *Philos. Trans. N. 57.*

APOGEE of the *Equant*, is the farthest distance of it from the Earth, or that Point where the Circumference of the *Equant* is intersected by the *Linea Apfidum* in the remotest part of the Diameter; as the *Perigee* of the *Equant* is the opposite Point of the nearest part of the Diameter. The *Mean*.

APOGEE of the *Epicicle*, is a Point where the *Epicicle* is cut above by a Right Line drawn from its Center to the Center of the *Equant*, or the Point of the *Epicicle* most remote from the Earth.

APOLOGETICAL, is what is said or written by way of Excuse or Apology for any Action.

APOLOGUE, is an instructive Fable, like those of *Æsop*.

APOMETRIMETRIE, is an Art teaching the Practiser how to measure things at a Distance, viz. how far they are off from him.

APONEUROSIS, is (with Anatomists) the spreading or extension of a Nerve or a Tendon out in Breadth, in the manner of a Membrane: Also the cutting off a Nerve or Tendon is so called.

APORE, in Mathematicks, is a Problem which tho' it be not impossible, yet it is very difficult to be resolved; and hath not yet actually been so: Thus the *Quadrature* of the Circle may be called an *Apo*, because there is yet no Way or Path discovered to lead us into it.

APORIME: See *Porime*.

APOPHLEGMATICAL Medicines, are such as are endowed with the Faculty of drawing cold puituous

pituitous Humours from the Head, and discharging them by the Nose or Mouth.

APOPHYGE, in Architecture, signifies that part of a Column where it seems to fly out of its Base, like the Process of a Bone in a Man's Leg, and begins to shoot upward. But this *Apo-phyge* is really no more than the Rings or Ferrils heretofore fastened at the Extremities of wooden Pillars to keep them from splitting, and afterward imitated in Stone Work.

APOPHYSIS, is a Protuberance made by the Fibres of a Bone, produced above its Superficies, and is ordinarily upon the Extremity of the Bones.

APOPLEXY, *Atonitus Stupor*, *Syderatio*, and *Morbus atonitus*, is a profound Sleep, wherein the Patient being either vehemently shaken, tossed or pricked, yet perceives nothing, nor affords any Sign of Action, accompanied with a Difficulty of Respiration for the most part, and sometimes with none at all. *Blanchard*.

APORRHEÆ, are Vapours and Sulphureous Effluviæ which exhale through the Pores of the Body.

APORRHEAS, a Word used by Mr. Boyle for Effluviæ; of the same Sense with the former.

APOSIOPEISIS, (a Figure in Rhetorick) is, when on a sudden, a Person changes his Passion, cutting off his Discourse, so that the Hearer cannot easily imagine what it is he intends: As it is very common upon Occasion of threatening, to say, *If I — &c. But, &c.*

APOSTARE LEGES, and *Apostatare Leges*, signifies, wilfully to break or transgress the Laws.

APOSTATA CAPIENDO, is a Writ directed to the Sheriff, for to take the Body of one, who having enter'd into, and professed some Order of Religion, leaves it and departs from his House, and wanders about the Country.

APOSTEM, the same with *Aposthume*.

APOSTROPHE, is a Figure in Rhetorick, when the Speaker is in an extraordinary Commotion, turns himself on all Sides, and addresses himself to all Beings, whether sensible or insensible; whom he, for the present, supposes to be equally capable of hearing his Complaint, and of returning an Answer to his Demands.

APOSTROPHE, also is an Accent in Grammar, shewing there is a Vowel to be rejected, and is expressed thus (') and placed over the Head of the Letter. *Vossius* writes it *Apostrophus*.

APOTHEGM, is a short pithy instructive Sentence spoken by some grave and considerable Man; or else made in Imitation of such. As the *Apothegms* of *Plutarch*, or those of the Ancients collected by *Lycosthenes*.

APOTOME, in Mathematicks, is an Irrational Remainder, or Residual Root; when from a Rational Line, as suppose *a*, you cut off a part as *b*, which is only commensurable in Power to the whole Line. Then 'tis express'd thus $a - \sqrt{b}$, and is called *Aporome*, because it signifies a Remainder left by cutting off *b*.

APOTOME, in Musick, is the Difference between the greater and the lesser Semitone.

APOZÈME, is a Decoction of Roots, Woods, Barks Herbs, Flowers, Fruits, Seeds, &c. which is boyled down commonly to Twelve, Fifteen or Twenty Ounces. It is either Purging, Loosening, Altering or Drying, *Cephalick*, *Stomachick*, *Dis-*

terick, *Splenetic* or *Hepatic*, according as the Indications of the Disease direct.

APPARENT CONJUNCTION: See *Conjunction Apparent*.

APPARENT HORIZON: See *Horizon*.

APPARENT Place of a Star, is a Point determined by a Line drawn from the Eye through the Center of the Star; whereas the *True* or *Real Place* is determined by a Line drawn from the Center of the Earth to the Star or Planet.

APPARENT PLACE of any Object in Opticks, is that (different from the real one) in which it appears when seen through one or more Glasses. For when by Refraction through Glasses, that parcel of Rays which fall on the Pupil of the Eye from each Point of any near Object, is made to flow as close together as that which comes from a distant one; or when by the same way, the Rays coming from distant Objects are made to Diverge as much as if they flowed from nigh ones, then the Eye must necessarily see the Place of the Object changed; which Change is its *apparent Place*.

If an Object be placed nearer to a Convex Glass than is the Distance of its Focus, its Apparent Place may be determined; as Mr. *Mohyneux* in *Dioptr.* p. 116. shews.

But if the Object be in the Focus of the Glass, the *Locus Apparens* of the Object cannot be determined; only, as Dr. *Barrow* saith, it will appear vastly remote.

Nor can the *Locus Apparens* be determined, if the Object be beyond the Focus of a Convex Glass. But if an Object be more distant from a Convex Glass, then its Focus and the Eye lie beyond the distinct Base, the *apparent Place* of the Object will be in the distinct Base.

APPEAL of *Mayhem*, (in Law) is an accusing of one that hath maimed another: But that being no Felony, the Appeal is but a kind of Action of *Trespas*, because there is nothing recover'd but Damages.

APPEAL, (in Law) is a removing of a Cause from an Inferior Judge to a Superior: Also a private Accusation of a Murderer, by one who had Interest in the murdered Party; or of any Felon, by one of his Complices in the Fact.

APPEAL of wrong Imprisonment, a Term in Law, is by some used for an Action of wrong Imprisonment.

APPELLANT, is he that brings an Appeal.

APPELLATIVE, a Term in Grammar, signifying a Name in Opposition to Proper, and which belongs to a whole Species or Kind, as *Man*, *Crymist*, &c.

APPELLOR or *Appellant*, the same with *Approver*.

APPENDANT and *Apurtenant* (in Law) are things that by time of Prescription have belonged, appertained, and are joyn'd to another principal thing, by which they pass and go as accessory to the same special thing, as Lands, Commons, &c. to a Mannor; Courts, Ways, &c. to a House, Office, or such others.

APPENDICULA VERMIFORMIS, so some Anatomists call the *Intestinum Cæcum*, or Blind Gut, from its Figure and manner of Situation, which in some Animals hangs pendulous like a Worm, and is not filled with Excrement, as it is in others.

APPENDIX, the same with *Epiphys*.

APPENSA, the same with *Periaptra*, such things as are hung about the Necks of diseased Persons, to free them from some Distempers which they labour under; such as a dried Toad to stop Bleeding, Peony Roots for Convulsions, &c.

APPERTINANCES, signify, in the Common-Law, Things both Corporeal, belonging to another thing, as the more principal; as Hamlets to a chief Mannor, Common of Pasture, Turpary, Piscary, and such like; and Incorporeal, as Liberties and Services of Tenants.

APPLICATE, in Geometry, is a Right Line, otherwise called the *Ordinate* or *Semi-ordinate* in a Conick Section: See the Word *Ordinate*, or any Treatise of Conick Sections.

APPLICATION, is sometimes the Geometrical Term for Division, the Reason of which see in *Geometrical Division*. But Application also signifies the fitting or applying one Quantity to another, whose Area's, but not Figures, are the same. Thus, Euclid, Book 6. Prop. 28. teaches how to a Right Line given, to apply a Parallelogram equal to a Rectilineal Figure given.

APPLICATE ORDINATE, (a Term in Geometry) see *Ordinate*. It signifies a Right-line applied at Right-angles to the Axis of any Conick Section, and terminated by the Curve.

APPLY, a Term used by Geometricians in three Senses.

1. It signifies to transfer a Line given into a Circle (most usually) or into any other Figure, so that it shall be there fitted or Accomodated, (which is also another Word they use for the same thing) according to its proper length.

2. 'Tis also used to express Division in Geometry, especially by the Latin Writers, who, as they say, *Duc 8 in 9*, when they would have 9 multiply'd by 8; so they say, *Applica 4 ad 12*, when they would have 12 divided by 4: See *Division Geometrical*, or in Lines, where the Reason of this way of speaking is explained.

3. It signifies also to fit Quantities whose Area's are equal, but Figures different, so that they shall conform to one another; as when Euclid in his sixth Book, teaches how, on a Line given, to apply a Parallelogram equal to a Rectilineal Figure given.

APPORTIONMENT, is a dividing into Parts a Rent which is dividable, and not entire or whole; and forasmuch as the thing out of which it was to be paid is separated and divided, the Rent also shall be divided, having Respect to the Parts.

APPORTUM, in Law, signifies Revenu, Gain or Profit, which a thing brings to its Owner.

APPOSAL of Sheriffs, is the charging them with Money received upon their Account in the *Exchequer*.

APPOSITION, in Grammar, is the putting of two or more Substantives together in the same Case.

APPRENDRE, in Law, signifies a Fee or Profit to be taken or received.

APPREHENSION, is the simple Contemplation of things that present themselves to the Mind, as when we consider the Sun, the Earth, a Tree, Roundity, a Square, Cogitation, Entity, pronouncing nothing expressly concerning them; and the Forms under which they are considered are called *Ideas*.

APPROACHES, in Fortification, are Works

cast up on both sides; so called because the Besiegers by that Means may draw near a Fortrefs without fear of being discovered by the Enemy. Or *Approaches* are all sorts of Advantages by the Help of which an Advancement may be made toward a place besieged.

APPROPRIARE COMMUNAM, to discommon, that is, to separate and enclose any parcel of Land that was before open Common.

APPROPRIATION, is when the Advowson of a Parsonage is given, or belongs to any Bishoprick, Religious House, College, &c. And to their Successors, so that the House or Body is both Patron or Parson, and some one of the Members officiates as Vicar. 'Tis called *Appropriation*, because the Profits of the Living are appropriate to the use of the Patrons.

APPROPRIATE ad HONOREM, a Term in Law, signifying to bring a Man not within the Extent or Liberty of such an Honour.

APPROVEMENT, is where a Man hath Common within the Lord's waste Ground, and the Lord encloses part of the Waste for himself, having nevertheless sufficient Common, with Egress and Regress for the Commoners. This Inclosing is called *Approvement*.

APPROVER, (in Law) is he who hath committed some Felony, which he confesses; and to save himself, impeaches his Accomplice or Accomplices; and he is so called, because he must Prove that which he hath alledged in his Appeal.

APPROVERS of the King, are those that have the letting of the King's Demains in small Mannors for the King's greater Advantage.

APPROXIMATION, in *Arithmetick*, or *Algebra*, is a continually coming still nearer and nearer to the Root or Quantity sought, without expecting to have it exactly. Of these Methods of Approximations, Dr. Wallis gives several Specimens in his History of Algebra, P. 317. and some have been invented since: They are all nothing but a Series infinitely converging or approaching still nearer to the Quantity required, according to the nature of the Series.

In *Philosoph. Trans.* N. 215. That excellent Mathematician hath a Discourse about the Methods of Approximation in the Extraction of *Surd Roots*, in which he designedly shews the Grounds and Reasons of the whole Business, and which therefore is very well worth the Reader's perusal: The Substance of what the Doctor delivers, is as followeth.

To begin with the *Square Root*.

From any non-quadrato Number or Quantity proposed (suppose n) subtract (in the usual manner) the greatest Square in Integers therein contained (suppose $a a$) the Remainder (suppose $b = 2a + e e$) is to be the Numerator of a Fraction, for designing the near Value of e the remaining part of the Root sought ($a + e = \sqrt{n}$) whose Denominator or Divisor is to be $2a$ (the double Root of the subtracted Square) or $2a + 1$ (that double Root increased by one) the true Value falling between these two; sometime the one, sometime the other, being nearest to the true Value. But (for avoiding negative Numbers) the latter is commonly directed.

The true Ground of the Rule is this; $a a$ being (by Construction) the greatest Integer Square contained in n , 'tis evident that e must be less than 1, (otherwise not $a a$, but the Square of $a + 1$, or

or some greater than it, would be the greatest Integer Square contained in n . Now if the remainder $b = 2a + ee$ be divided by $2a$, the result will be too great for e , (the Divisor being too little, for it should be $2a + e$ to make the Quotient e). But if (to rectify this) we diminish the Quotient by increasing the Divisor, adding 1 to it, it becomes too little, because the Divisor is now too big. For (e being less than 1) $2a + 1$ is more than $2a + e$, and therefore too big.

As for Instance; if the Non-quadrat proposed be $n = 5$, the greatest Integer Square therein contained is $a^2 = 4$ (the Square of $a = 2$) which being subtracted, leaves $n - a^2 = 5 - 4 = 1 = b = 2ae + ee$; which being divided by $2a = 4$, gives $\frac{1}{4}$; but divided by $2a + 1 = 4 + 1 = 5$, gives $\frac{1}{5}$: That too great, and this too little for e . And therefore the true Root ($a + e = \sqrt{n}$) is less than $2\frac{1}{5} = 2,25$, but greater than $2\frac{1}{4} = 2,25$: And this was anciently thought an *Approach* near enough.

If this *Approach* be not now thought near enough, the same Process may be again repeated; and that as oft as is thought necessary.

Take now for $a, 2\frac{1}{5} = 2,25$, whose Square is $4,84 = a^2$ (now considered as an Integer in the second place of Decimal Parts) this subtracted from 5,00 (or, which is the same 0,84, the excess of this Square above the former, from 1, which was then the remainder) leaves a new remainder $b = 0,16$; which, divided by $2a = 4,4$, gives $\frac{16}{44} = \frac{4}{11} = 0,3636$ +, too much: But divided by $2a + 1 = 4,5$, it gives $\frac{16}{45} = \frac{32}{90} = 0,3555$ +, too little. The true value (between these two) being $2,236$ *proxime*, whose Square is 4,999696.

If this be not thought near enough, subtract this Square from 5,000000: The remainder $b = 0,000304$, divided by $2a = 4,472$, or by $2a + 1 = 4,473$, gives (either way) 0,000068 -; which added to $a = 2,236$, makes $2,236068$ -, somewhat too big; but $2,236067$ +, would be much more too little.

Which gives us the Square Root of 5, adjusted to the sixth Place of Decimal Parts, at three steps. And by the same method, if it be thought needful, we may proceed further.

It were easy to compound the Process of two or more Steps into one, and give (for the Rule) the Result of such Composition, which would make it seem more intricate and mysterious, to amuse the Reader.

In the *Cubick Root* (consonant to the Quadratick) the Rule is this:

From the *Non-Cubick* proposed (suppose n) subtract the greatest Cube in Integers therein contained (suppose aaa) the Remainder (suppose $b = 3aae + 3aee + eee$) is to be the Numerator of a Fraction for designating the value of e , (the remaining part of the Root sought, $a + e = \sqrt[n]{n}$). To this Numerator, if (for the Denominator or Divisor) we subjoin $3aa$, the Result will certainly be too great for e , because the Divisor is too little: (For it should be $3a + 3ae + ee$, to give the true value of e). If for the Divisor we take $3a + 3a + 1$, it will certainly be too little, because the Divisor is too great. (For e by construction is less than 1.) It must therefore (between these Limits) be more than this latter; and therefore this latter Result being added to a , will give a Root whose Cube may be subtracted from

the Non-Cubick proposed in order to another step.

But if for the Divisor, we take $3a + 3a$ (or even less than so) the Result may be too great; or (in case b be small) it may be too little, and oft is so.)

Which comes to pass from hence, because e (by Construction) is less than 1; and therefore $3ae$ less than $3a$; and perhaps so much, as that the Addition of ee will not redress it. And when it so happens $3a + 3a$ is a better Divisor than $3a + 3a + 1$, (or even somewhat less than either). But because it doth not always so happen (tho' for the most part it doth) the Rule doth rather direct the other; as which doth certainly give a Root less than the true value, whose Cube may always be subtracted from the Non-Cubick proposed. The Design being to have such a Cube, as (being subtracted) may leave another b to be ordered in like manner for a new Approach. But for the most part $3aa$ may be safely taken for the Divisor: For tho' the Result will then be somewhat too big, yet the excess may be so small as to be neglected; or at least we may thence easily judge what Number (somewhat less than it) may be safely taken; and if we chance to take it somewhat too big, the Inconvenience will be but this, that b for the next step will be a Negative; of which Case we shall speak anon.

Thus for Instance; if the *Non Cube* proposed be $9 = n$, the greatest Integer Cube therein contained is $8 = aaa$ (whose Cubick Root is $a = 2$) which Cube subtracted, leaves $9 - 8 = 1 = b = 3aae + 3aee + eee$. This divided by $3aa = 12$, gives $\frac{1}{12} = 0,08333$ +, too big for e ; but the same divided by $3a + 3a + 1 = 12 + 6 + 1 = 19$, gives $\frac{1}{19} = 0,05263$ +, too little; or if but by $3a + 3a = 2 + 6 = 8$, it gives $\frac{1}{8} = \frac{1}{8} = 0,125$ +, too much. For the Cube of $a + 0,06 = 2,06$, is but $8,742$ -, which is short of 9: And so much short of it, that we may safely take $2,07$ as not too big; or perhaps $2,08$ (which, if it chance to be too big) it will not be much too big (as shall be farther shewn:) And upon trial it will be found not too big; for the Cube of $2,08$, is $8,998912$.

If this Step be not near enough, this Cube subtracted from 9,000000 leaves anew $b = 0,001085$, which divided by $3aa = 12,9796$, gives $0,000084$ -, which will be somewhat too big, but not too much (for e is now so small) as that $3ae$ may be safely neglected (and ee much more) so that if to $2,08$ we add $0,000084$ -, the Result $2,080084$ will be too big, but $2,080083$ will be more too little; (as will appear if we take the Cube of each) so that either of them at the second Step, gives the true Root within an Unite in the sixth place of Decimal Parts.

He says, (taking the Cube of each; which he does) that the thing may be more clearly apprehended, but it is not necessary that we trouble our selves with the whole Cube: For aaa being already subtracted, for finding $b = 3aae + 3aee + eee$, we have no more to try, but whether $3aae + 3aee + eee$ be greater or less than b , according as we take $0,000084$, or $0,000083$, for e .

Which may be conveniently done in this manner: Take $3a + e$ and multiply this by e (or e by it) so have we $3ae + ee$; to this add $3aa$, and multiply the whole by e (so have we $3aae + 3aee$

$3aae + eee$) to see whether this be greater or less than b .

That is, in the present Case, if we take $e = 0,000084$, and add to this $3a = 6,24$, then is $6,240084 = 3a + e$: This multiply'd by $e = 0,000084$, is $3ae + eee = 0,000524 +$; to which, if we add $3a = 12,9792$, it is $3a + 3ae + eee = 12,979724$, which multiply'd again by $e = 0,000084$, is $0,0010902 +$, $= 3aae + 3aee + eee$, which is more than $b = 0,001088$.

But if we take $e = 0,000083$, and proceed as before, we shall have $3ae + 3aee + eee = 0,001077 +$, which is less than b , and therefore (if we subtract that from this) the Remainder $0,000011$, will be another b for the next Step, if please to proceed further.

Hitherto we have pursued the Method most affected by the Ancients, in seeking a Square or Cube (and the like of other Powers) always less than the just Value, that it might be subtracted from the Number proposed, leaving b a positive Remainder, thereby avoiding Negative Numbers.

But since the Arithmetick of Negatives is so well understood, it may in this (and other Operations of like nature) be advisable to take the next greater (in case that be nearer to the true value) rather than the next lesser.

According to this Notion for the Square Root of 5, I would say, it is $(2 +)$ somewhat more than 2, and enquire, how much more? But for the Square Root of 8, I would say, it is $(3 -)$ somewhat less than 3, and enquire, how much less? Taking in both Cases that which is nearest to the just Value.

Thus, in the Cubick Root before us, I take for e (in the last Enquiry) $0,000084$ (where, for the near Step, we have $b = -0,000002$) rather than $0,000083 +$ (where, for the next Step, we should have $b = +0,000011$). In this latter Case we are to divide $b = +0,000011$, by $3a = 12,980236 -$, to find (by the Quotient) how much is to be added to $0,000083$. In the other Case, we are to divide $b = +0,000002$, by $3a = 12,980248$, to find (by the Quotient) what is to be abated of $0,000084$, so have we $\frac{0,000011}{12,980236} = 0,00000085 +$, to be added to $6,240083$: Or $\frac{0,000002}{12,980248} = 0,00000015 +$ to be abated of $6,240084$: (Or it may suffice in either, to divide by $12,98 +$, or even by $13 -$, without being incumbered with a long Divisor) either of which gives us, for the Root sought, $2,08008385$ *proxime*. True (at the third Step) to the eighth place of Decimal Parts. And if this be not near enough, the Cube of this compared with the Number proposed, will give us another b , for the next Step, and so onwards as far as we please.

Now, what is said of the Cube, is easily applicable to the higher Powers.

That of the Biquadrate may be omitted, because here perhaps it may be thought most advisable to extract the Square Root of the Number proposed; and then the Square Root of that Root.

But if we would do it at once, we are from n (the Number proposed, being not a Biquadrate) to subtract a^4 (the greatest Biquadrate contained in it) to find the Remainder $b = 4a^3e + 6a^2e^2 + 4ae^3 + e^4$, which Remainder, if we

divide by $4a^3$, the Quotient will certainly be too big for e (tho' perhaps not much).

If by $4a^3 + 6a^2 + 4a + 1$, it will certainly be too little (for Reasons before mentioned.) And we are to use our Discretion in taking some intermediate Number. And if we thence chance not to hit on the nearest, the Inconvenience will be but this, that our leap will not be so great as otherwise it might be, which will be rectify'd by another b at the next Step.

For the *Surfolid* (of the five Dimensions) we are from n (the Number proposed, being not a perfect *Surfolid*) to subtract a^5 (the greatest *Surfolid* therein contained) to find the Remainder.

$$b = 5a^4e + 10a^3e^2 + 10a^2e^3 + 5ae^4 + e^5.$$

which (as before) if we divide by $5a^4$, the Result will be somewhat too big (because the Divisor is too little).

If by $5a^4 + 10a^3 + 10a^2 + 5a + 1$, the Result will certainly be less than the true e . The just Value of e being somewhat between these two, where we are to use our Discretion, what intermediate Number to take; which according as it proves too great or too little, is to be rectify'd at the next Step.

If to direct us in the choice of such intermediate Numbers, we should multiply Rules of Precepts for such choice, the trouble of observing them would be more than the advantage to be gained by it. And for the most part it would be safe enough (and least trouble) to divide by $5a^4$, which gives a Quotient somewhat too big; which we may either rectify at Discretion (by taking a Number somewhat less) or proceed to another b (affirmative or negative as the Case shall require) and so onward to what exactness we please (which is, for substance, in a manner coincident with Mr. Raphson's Method, even for affected Equations).

Thus, in the present Case; if the Number proposed be $n = 33$, then is $a^5 = 32$, and $b = 33 - 32 = 1 = 5a^4e + 10a^3e^2 + 10a^2e^3 + 5ae^4 + e^5$, which if we divide by $5a^4 = 5 \times 16 = 80$, the Result $\frac{1}{80} = 0,0125$ is somewhat too big for e , but not much. And if we examine it, by taking the *Surfolid* of $2,0125$, or of $2\frac{1}{8}$, we shall find a Negative b (for the next Step) but not very considerable. Or if we think it considerable, we may proceed further to another Step, or more than so.

The like Method may be apply'd (with more advantage) in the higher Powers, according as the Composition of each Power requires. And the same Method may be of use (with good Advantage) in long Numbers (if ducly applied) even before we come to the place of Units, for the same will equally hold there also.

APPURTENANCES, in the Common Law, are the same with *Appendante*: Which see.

APSID, in Astronomy is used as well for the *biggest part* of an Orbit, to which when a Planet comes, it is at the greatest distance from the Earth, and is called the *Apogaeum*; as the *lowest part* of that Orbit, when the Planet is in his nearest distance to the Earth, which is called the *Perigaeum* of that Planet.

APTITUDE, is the natural Disposition that any thing hath to be fitting for such or such a Pur-

Purpose. Thus Oil hath an Aptitude to burn; and Water to extinguish Fire.

APTOTE, (in Grammar) is a Noun Indeclinable, or which is without the variation of *Cafe*.

APYREXY, is an Intermiffion, cooling, or abating of a Fever; the Cause of it is, that all the Morbifick Matter is spent in one Fit, and so it intermits till new come, and begins to swell and ferments as the other. *Blanchard*.

AQUÆDUCTUS, (in Anatomy) is the Bony Passage of the Tympanum of the Ear, reaching into the Palate of the Mouth.

AQUA FORTIS, is made by distilling in a close Reverberatory Furnace a Mixture of equal Parts of Purified Nitre, *Vitriol calcined white*, and Potter's Earth or Clay dried and powdered. A small Fire is used at first to warm the Retort, and to draw off the Phlegm; but as soon as the Spirits begin to appear in the Receiver in Red Clouds, the Fire is raised to the most intense Degree, and kept so till White Fumes begin to come forth; then unlute the Vessels, and you have the *Aqua Fortis* in the Receiver. 'Tis used to dissolve Metals.

AQUALICULUS, the lowest part of the Belly, being the same with *Hypogastrium*.

AQUARIUS, a Constellation in the Heavens, being the Eleventh Sign in the Zodiac; it is commonly marked with this Character ☾, and consists of 33 Stars.

AQUATICK or AQUATILE, is that which belongs to, or lives mostly in the Water: Thus those Animals or Plants that live or grow usually in Water, are called *Aquatick Animals* and *Plants*.

AQUEDUCT, is the Term in Architecture for a Conduit or Work to convey Water (without Force of Engines) to any Place.

AQUEOUS HUMOUR, or the watry Humour of the Eye, is the utmost being transparent, and of no Colour; it fills up the Space which lie between the Cornea Tunicle and the ChrySTALLINE Humour.

AQUILA ALBA, or the white Eagle, the same with *Mercurius Dulcis*, which see.

AQUILA, or Vultur Volans, a Constellation in the Northern Hemisphere, consisting of 32 Stars.

ARA, the Altar, a Southern Constellation, containing 8 Stars.

ARACNOIDES, is the ChrySTALLINE Tunic of the Eye; by some called also

ARANEA TUNICA, or ChrySTALLINA; and is that which furrounds and contains the ChrySTALLINE Humour; by reason of its light thin Contexture, like that of the Web of a Spider, it has the Name of *Aranæa*. This Coat, by means of the Ciliary Processes, helps to move the ChrySTALLINE Humour of the Eye nearer to, or farther from the Retina, and perhaps also to render its Figure more or less Convex.

ARÆOSTYLE, in Architecture, is a sort of Edifice where the Pillars are set at a great Distance one from another.

ARBITRATOR, is an extraordinary Judge in one or more Causes between Party and Party, chosen by their mutual Consents. The Civilians distinguish between *Arbiter*, who is to proceed and judge according to Law and Equity mingled, and *Arbitrator*, who is permitted wholly to use his own Discretion, without Solemnity of Process, or

Course of Judgment, to hear and determine the Controversy committed unto him.

ARBITREMENT, is a Power given by two or more contending Parties, to some Person or Persons to determine the Matter in Dispute between them; and to pronounce the same, to which they bind themselves under a Penalty to stand: And the Determination thus made is called an *Award*; or the Result of an *Arbitration*.

ABOR DIANÆ: See *Diana's Tree*.

ARBOR MARIS, a Name by some Chymists given unto Coral, because it grows like a Tree or Plant under the Water of the Sea.

ARBOREOUS, is by the Botanists used for such Fungi or Musci which grow upon Trees, whereas others grow on the Ground. Thus *Agaric* is a *Fungus Arboreus*, because it always grows on the Larix. But the *Fungus Pulverulentus* is Terrestrial, always growing on the Ground.

ARBORIST, is one that hath good Skill in the several Kinds and Natures of Trees; and knows how to propagate and preserve them well for their several Uses.

ARCANUM CORALINUM, is the Red Precipitate of Mercury, on which hath been burnt six times, well rectify'd Spirit of Wine, in order to burn off some of the Acids, and to sweeten the Precipitate so as that it may be fit to be taken inwardly.

ARCANUM DUPLUM, is a kind of a Salt gain'd by washing the Caput Mortuum remaining after the Distillation of double *Aqua Fortis* with warm Water; which Water is afterwards filtrated and evaporated, and the Salt remains at the Bottom of the Glass.

ARCANUM JOVIS, is an Amalgama made of equal Parts of Tin and Mercury, powder'd and digested with good Spirit of Nitre; and from it the Spirit being drawn in a Retort, the dry Mass is powdered again, and then digested with Spirit of Wine till the Powder be insipid.

ARCH or ARC, in Geometry is any part of the Circumference of a Circle.

ARCHAISMS, are obsolete Expressions now out of use, and to be found only in ancient Authors.

ARCHES, (or the Court of the Arches) is the chief and most ancient Consistory belonging to the Archbishop of Canterbury, and it is so called from the Arches of the Church where the Court is kept namely, Bow-Church in London.

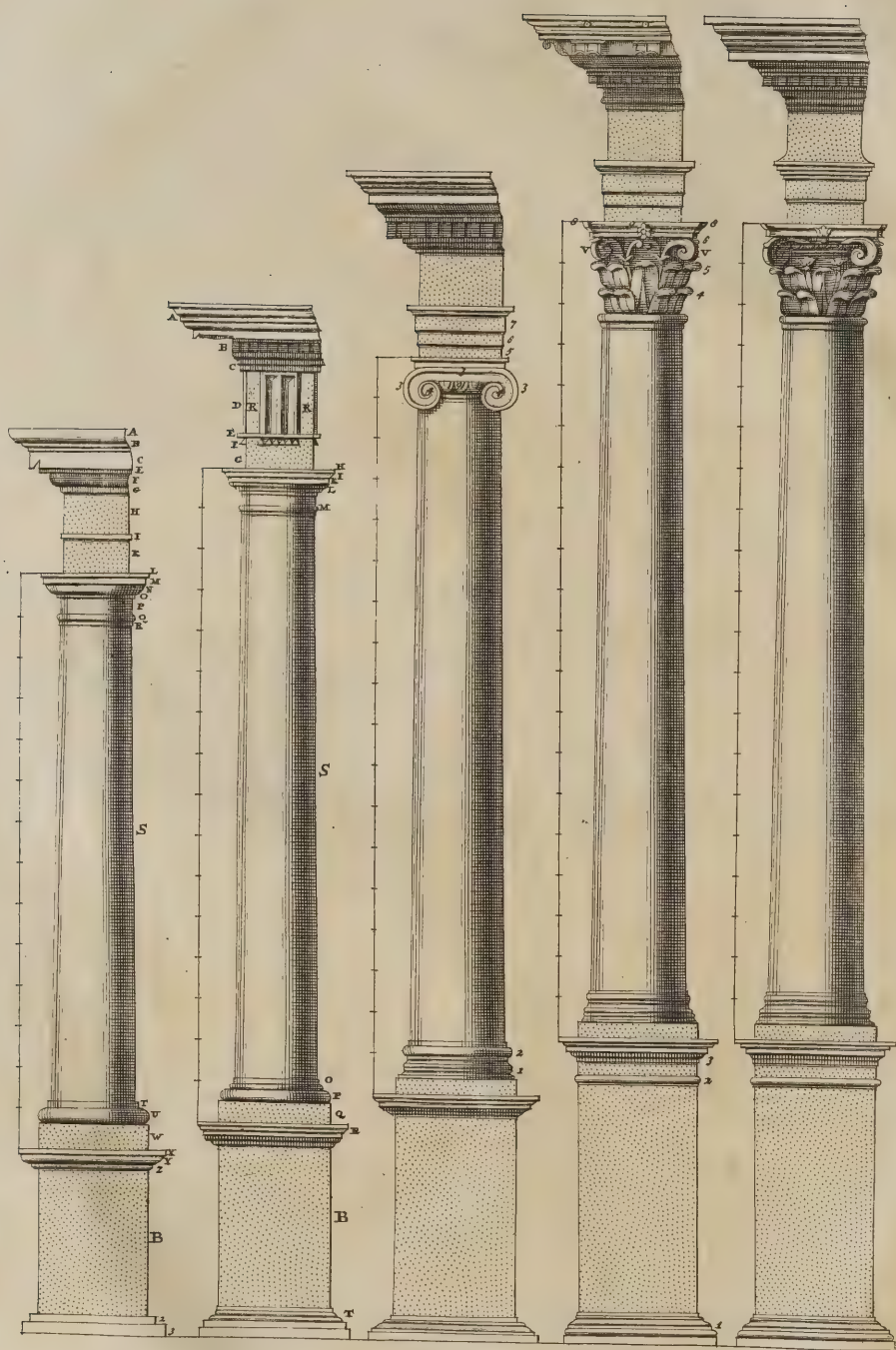
ARCHÆUS, with the Paracelsians, is the Principle of Life, Health and Vigour in any Animal Body.

ARCHIPELAGUS, in Geography, is a part of the Sea containing many small Islands one near another, and consequently several little Seas denominated from those Islands; as the Grecian Archipelago or *Ægean Sea*.

ARCHITECTONICK, is that which builds a Thing up regularly according to the Nature and Properties of it. Thus that plastick Nature, Power, Spirit, or whatever it be called, which hatches the Ova of Females into living Creatures of the same Species, is by some called the *Architectonick Spirit*.

ARCHITECTURE, is the Art or Science of Building, and is usually divided into *Civil* and *Military*; *Civil Architecture* teaches how to make any kinds of Buildings, Palaces, Churches or private Houses. *Military Architecture* instructs us in the





TUSCAN

DORICK

IONICK

CORINTHIAN

COMPOSITE

The Explanation of the Plate for the Five Orders of Architecture.

In the Tuscan Column.

- a* The *Ovolo* or *Egg*: In the *Ionick* and *Corinthian* Orders, and every where by some 'tis called the *Echinus*. The *French* call it the *Quart de rond*.
- b* The *Astragal* or *Baguette*, as the *French* call it: The *Italians* the *Tondino* or *Round*; below which is a small *List*, *Reglet* or *Fillet*.
- c* Is the *Crown*, the *French* call it the *Larmier*.
- e* The *List* or *Fillet* under that.
- f* The *Gula* or *Talon* in *French*.
- g* The *List* of the *Gula*.
- H* The *Frieze*.
- i* The *List* of the *Architrave*.
- k* The *Architrave*,
- l* The *List* of the *Abacus*.
- m* The *Abacus* *Cymatium* or *Saillon*, as the *French* call it.
- n* The *Ovolo* or *Echinus*.
- o* The *List*, *Ring* or *Fillet* under that.
- p* The *Frieze* of the *Capital*: The *French* call it the *Gorgerin* or *Collarin*.
- q* The *Astragal* of
- r* The *Conge* or *Ceinture*, as the *French* call it; or of the *Neck* of the *Column*.
- s* The *Body* of the *Column*; in *French* the *Fust* or *Vif*.
- t* The *Listel* of the *Base*, or the *Nether-band* or *Swath*.
- u* The *Tore*, or the *Gros Baton*, in *French*.
- w* The *Plinth*.
- x* The *Riglet*, *List* or *Fillet*.
- y* The *Gula* reversed, or the *Talon*.
- z* The *Ring*, *List* or *Fillet*.
- B* The *Die* of the *Base*.
- 2* The *Reglet* or *Fillet*.
- 3* The *Base* of the *Pedestal*; in *French* the *Zocle*.

In the Dorick Column.

- a* The *Gula*, sometimes the *Grove* or hollowing of the upper *List*.
- b* The *Dentils* or *Teeth*.
- c* The *Capital* of the *Trygliph*.
- d* The *Trygliph*, of which those *Parts* that are framed inwards or hollowed, are called *Flutes*: And the *Square* of the *Frieze* between the *Trygliph* is called the *Metops*, as *r*; and sometimes

the outermost towards the *Right-hand* is called a *Demi-Metops*.

- e* The *Cymatium* or *Bandelette*.
- f* The *Gutta* or *Drops*.
- g* The *Platteband* or *Face*.
- h* The *Reglet*.
- i* The *Talon* or *Gula*.
- k* The *Ovolo* or *Echinus*.
- l* Three *Annulets* or *Fillets*.
- m* The *Frieze*, *Gorgerin* or *Collarin*.
- S* The *Fust*, *Shaft* or *Body* of the *Pillar*.
- o* The *Listel*.
- p* The *Tore*.
- q* The *Plinth*.
- r* The *Fillets* and *Gula*.
- B* The *Die* of the *Base*.
- t* The *Fillets* or *Reglets* of
- u* The *Base* of the *Pedestal*.

In the Ionick Column, the Things in which it differs from the former, are these.

1. The *First Scotia*.
2. The *Second Scotia*.
3. The *Bands* or *Canal* of the *Volute*.
4. The *Volute*.
5. The *First* or *Little Face*.
6. The *Second* or *Middle Face*.
7. The *Third* or the *Great Face*.
9. The *Figure* of *Eggs* carved there.

In the Corinthian Column, the Things peculiar are.

1. A *Tore*, *Reglet* and *Gula* finely wrought.
2. A *Reglet* and *Astragal*, with
3. *Frieze* about it.
- 4, 5, 6. The *Ranks* or *Rows* of *Leaves*, some say of the *Acanthus* or *Great Dock*, others of *Olive*, and others of *Palm*.
8. The *Abacus* of the *Capital*.
9. The *Flower*.

In the Composite Order.

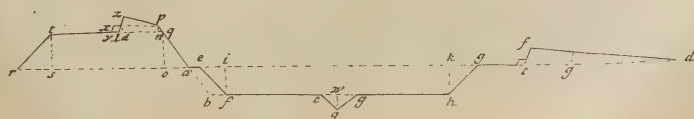
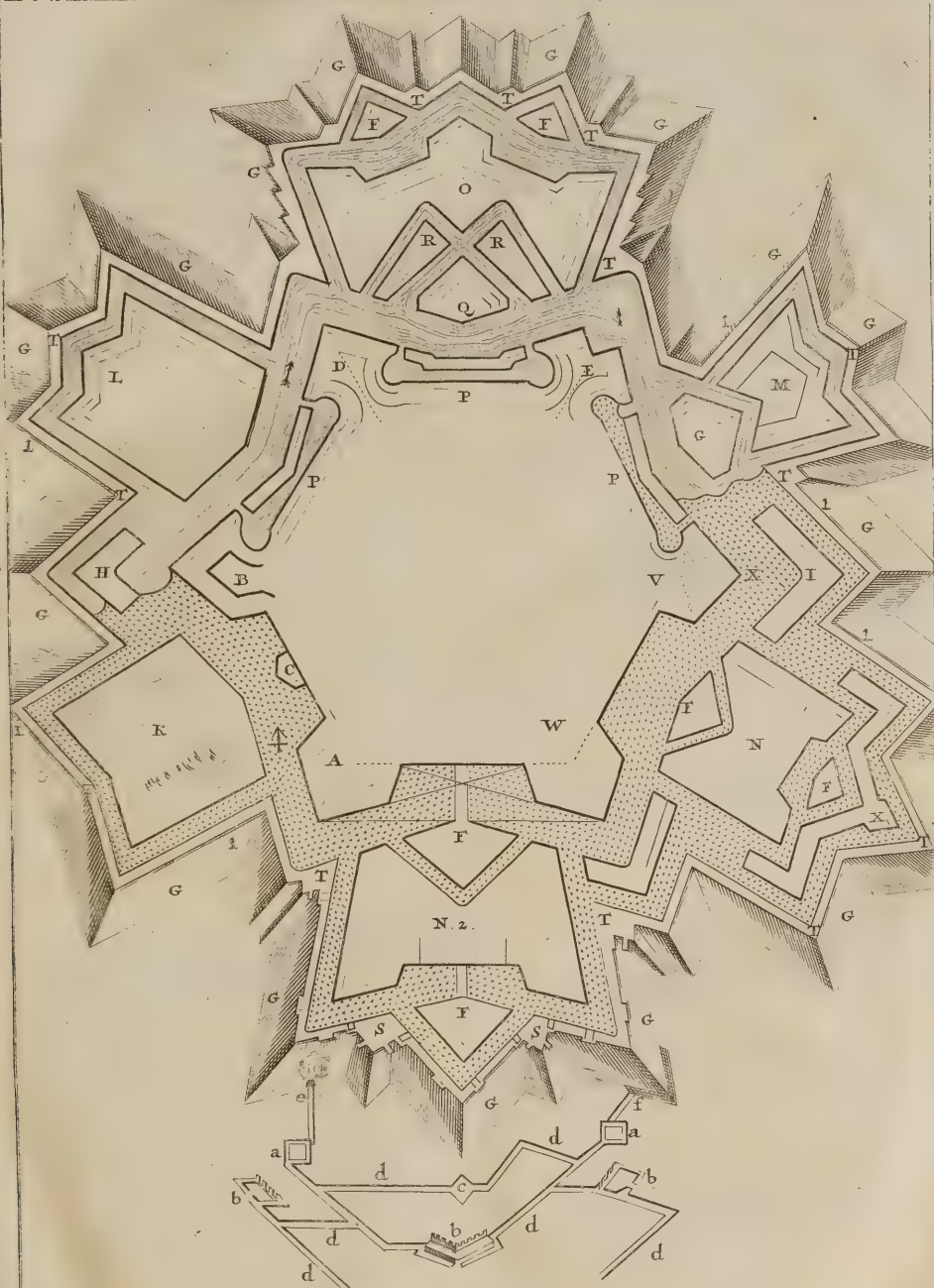
The *Pedestal* of this *Column*, is the same with that of the *Corinthian*, except in the *Members* of the *Cymatium* and *Base*. And the *Composite Capital* differs from the *Corinthian* only in this, That it hath *Volute* or *Scrolls* like the *Ionick*, when the *Corinthian* hath curled *Stalks*; and therefore 'tis called *Composite*, because composed of the *Ionick* and *Corinthian* together.

The Explanation for the Plate of Fortification.

- A** *A Single Bastion.*
- B** *A Double Bastion or Cavalier*, to overlook the Enemy's Bastions, and to scour their Trenches.
- C** *A Platt Bastion*; which is made when the Line of Defence is too long; *i. e.* exceeds 150 Fathom, which is the Distance a Musket will be sure to do Execution. Wherefore this *Platt-Bastion* is placed in the middle of the Curtain.
- D** *A Half-Bastion* placed on the Side of a River.
- E** *A Bastion Tenailled*; when the Angle of the Bastion is less than 70 Degrees
- F** *A Ravelin* which covers the Gates, Bridges and Curtains. Sometimes these Ravelins have Flanks made to them, as G.
- G** *A Ravelin with Flanks.*
- H** *An Half-Moon*, made to cover the Flanked-Angle of the Bastion. The Gorges of *Half-Moons* are circular.
- I** *Counter-Guard*, which are raised instead of *Half-Moons*.
- K** *A Single Tenaile.*
- L** *A Queue D'Yronde, or Swallow's-Tail*: So called, because its Sides instead of being parallel, open or spreads towards the Head, and grow narrow at the Gorge.
- M** *A Bonnet, a Pestre, or Priest's-Cap*: Some call them *Double Tenailles*. But they differ from a *Tenaile*, because its Sides are not parallel, but spread or open out towards the Campaign like a *Swallow's Tail*. This Work hath two Angles *Saillant*, and two Inwards.
- N** *A Horn-work*, whose Heads is fortified with two *Demi-Bastions*, or *Epaulements*, joy'n'd by a Curtain, and closed by parallel Sides ending at the Gorge of the Work. These *Horn-works* are used to cover the Gates, &c. instead of *Tenailles*.
- N 2**, *A Horn work*, whose Sides are not parallel.
- O** *A Crown-work*, whose Design is to cover some large Spot of Ground to defend a Rising-Ground, or to defend the Head of a Camp that is intrenched: 'Tis the largest of all Outworks, having a large Gorge, and two Sides, ending towards the Campaign in two *Demi-Bastions*; each of which joyns by a Curtain, to an entire Bastion that is at the Head of the Work.
- P** *Tenailles* to defend the Ditch.
- Q** *An Half-Moon* covered with two *Counter-Guards* R R, to make it the stronger.
- SS** *Places of Arms* on the *Counterscarp*, being open Spots of Ground for the Garrison to Rendezvous on an Alarm, &c.
- T** *The Ditch.*
- T T, &c.** *The Counterscarp, or Covered-way.*
- g g, &c.** *The Glacis.*
- V** *A Retrenchment* within or behind a Breach; as X.
- W** *A Place for a Magazine.*
- l l l** *Pallisades.*
- a a** *Redoubts.*
- b b b** *Batteries.*
- c** *Lines of Communication.*
- d d** *Trenches*, by which the Approaches are carried on.
- e** *Mine* under the *Glacis* and *Covered-way* of the *Horn-work*.
- f** *A Lodgment* at the Foot of the *Glacis*.

Explanation of the Profile.

r a	The Base of the Rampart	70 Feet	a e	The Berme	3 Feet
r s	Its Height	16	e g	The Breadth of the Moat	112
r s	The Inward Talus	16	i f	Its Depth	12
o a	The Outward Talus	8	f b	Its Breadth at the Bottom	88
l q	The Base of the Parapet	21	e s k g	The Talus's, each	12
Z d	The Inward Height	6	e g	The little Ditch at the Bottom of the Moat	18
n p	The Outward Height	4	q w	Its Depth	5
n q	The Outward Talus of the Parapet	2	g c	The Covert-way	18
o d	The Inward	1	i c d	The Seat of the Parapet	60
y l	The Breadth of the Foot-Bank	3	e f	Its Height	6
y x	The Height of it	1½	f d	The Glacis	
z y	The Terre-Plane.	25			



Scale of Feet for the Profile

the best way to fortify Cities, Camps, Sea-Ports, or any other Places of Strength.

The Ancients at several Times, and on several Occasions, establish'd 5 Orders of *Architecture*, that is, 5 sorts of Pillars, viz. the *Tuscan*, the *Doric*, the *Ionick*, the *Corinthian*, and the *Composite* or *Roman Order*, (which see under those Words.) The Difference between which Orders consists in the *Column*, with its *Base* and *Capital*, and the *Entablature*, that is, the *Architrave*, *Frieze* and *Cornice*; for these are the Parts which constitute the *Order*, and each one hath its proper and peculiar Measures.

Besides these five Ancient Orders, some Authors mention two more, as that of the *Caryatides* and the *Perseick*, (which see.)

The Rules of *Architecture* require, That in a well-built Fabrick there should be *Solidity*, *Convenience* and *Beauty*; to which some Writers add, *Order*, *Disposition*, *Proportion*, *Decorum* and *Oeconomy*: And these Eight, they say, make the necessary Parts of *Architecture*. *Solidity*, implies the Choice of a good Foundation, and good sound Materials to work with. *Convenience* consists in so ordering and disposing the Parts of an Edifice, that they may not hinder or embarrass one another. *Beauty* is that agreeable Form and pleasing Appearance which it exhibits to the Eye of the Spectator. *Order* (they say) gives each Part of the Building a convenient Bigness, whether we consider them apart, or with Relation to the Whole. And *Disposition* they make the due Ranging and agreeable Union of all the Parts.

Proportion, is the Relation that all the Work hath to its Parts, and which every one separately hath to the *Idea* of the Whole: For among Works that are perfect, from any particular Part we may make a certain Judgment of the Greatness of the whole Work: u. gr. the *Diameter* of a Pillar, or the Length of a *Triglyph*, gives us a right *Idea* of the Whole to which they belong: And to express the Relation that many things have to one another, as to their Greatness, and the different number of their Parts, *Vitruvius* indifferently uses those three Words; *Proportion*, *Eurithmy* and *Symmetry*; the two last of which are of much the same Sense with the first.

Decorum or *Decency* comes next to be considered, which consists in making the whole Aspect of the Fabrick so correct, that nothing shall appear but what is founded upon, and approved by some Authority: And they say, *Decorum* teaches you to have a Regard to these three things, *Design*, *Custom* and *Nature*. The Regard to *Design* makes us choose (for Instance) other Dispositions and Proportions for a Palace than a Church. The Respect we pay to *Custom*, makes us adorn the Porches and Entries into such Houses as are within Rich and Magnificent. And the Regard we have to the *Nature* of the Places, makes us pitch upon different Prospects for different Parts of a Building: As for Example, we expose Bed-Chambers and Libraries to the Morning Sun: Winter Apartments to the West, and Closets of Pictures, &c. to the North, because they require an equal Light.

Oeconomy teaches the Architect (they say) to have regard to the Expenses that are to be made, and the Quality of the Materials, near the Places where he builds, and to take his Measures rightly for the Order and Disposition, viz. to give the Fabrick a convenient Form and Magnitude.

ARCHITRAVE, is the chief Beam in any Building, and the first Member of that which is called the *Entablature*, viz. that part of a Stone Pillar which is above the *Capital*, and below the *Frieze*. And 'tis called the *Reason-Piece* or *Master-Beam* in Timber Buildings; but in Chimneys it is called the *Mantle-Piece*, and over the Jambes of Doors or Lintels of Windows *Hyperthyron*. The Greeks called it the *Epistyle*.

ARCTICK CIRCLE, is a Lesser Circle of the Sphere drawn on the Globe, parallel to the Equator, and at 23°. 30'. distant from the North Pole of the World, from whence it takes its Name. This, and its opposite the *Antarctick*, are called the two *Polar Circles*. They may be conceived to be describ'd by the Motion of the Poles of the Ecliptick round the Poles of the Equator, or of the World.

ARCTOPHYLAX, see *Bootes*.

ARCTOSMINOR, the same with *Ursa Minor*.

ARCTURUS, a fixed Star of the first Magnitude placed in the Skirt of *Arctophylax*: Its Longitude is 199°. 39'. Latitude 31°. 2'. Right Ascension 210°. 13'. and Declination 20°. 58'.

ARDENT SPIRITS, in Chymistry, are such Spirits as being distilled from fermented Vegetable, will take fire and burn, as Spirit of Wine, Brandy, Aqua Vitæ, &c. They are usually distilled in an Alembick, or in a Copper Body with its Moor's Head and Refrigeratory.

ARDOR VENTRICULI, is the Disease commonly called the *Heart-burning*.

ARDOR URINÆ, is the same with *Dysuria*.

AREA, of any Figure in Geometry, is its Internal Capacity or Superficial Content reckoned in the Square Parts of any Measure; as if a Field be in the Form of a Square, and its Side be 40 Yards in length, its *Area* or Superficial Content will be 1600 Square Yards: Or will contain 1600 little Squares, each of which is a Yard every way.

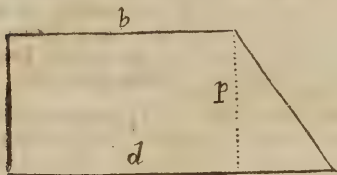
Problems. To find the Area of all sorts of Plane Figures.

1. For a *Square* or *Rectangle*, multiply one Side found in any known Measure by another: The Product is the true *Area*. The Reason of which you have under *Multiplication in Geometry*: which see.

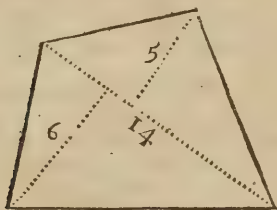
2. For all *Parallelograms*, multiply the Perpendicular let fall from any side, by the side it falls upon; and the Product is the *Area*. Because all such Figures are equal to Rectangles of the same or equal Base and Altitude.

3. For all *Plane Triangles*, multiply half the Perpendicular let fall from an Angle, by the opposite side, or half that side by the Perpendicular, and the Product is the true *Area*; because Triangles are the Halves of Parallelograms of the same or equal Bases and Altitudes.

4. For a Trapezium, where two Sides are Parallel, multiply the Sum of the Parallel Sides (b and d) by half (p) the Perpendicular.



5. For any other Trapezium, or any Multangular Plane Figure, resolve it Diagonally into Triangles; and add the Area's of those Triangles (found by the 3d Problem) into one Sum; which will be the true Area of the whole. Thus, suppose a Trapezium whose Sides are not parallel, divide it into two Triangles by a Diagonal, and let fall a Perpendicular from the other Angles thereto; then multiply the whole Base by half the Sum (or half the Base by the whole Sum) of the Perpendiculars, the Product is the Area.



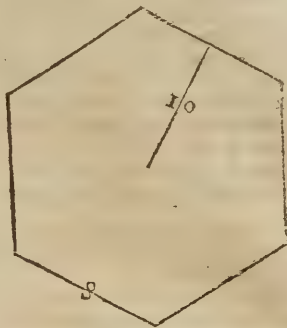
Base 14, its half 7
Sum of the Perpend. 11, its half 5.5.

$\begin{array}{r} 14 \\ 5.5 \\ \hline 70 \\ 70 \\ \hline 77 \end{array}$	$\begin{array}{r} 11 \\ 7 \\ \hline 77 \end{array}$	Area 77.
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6. For all Regular Figures or Polygons, multiply the half Sum of all the Sides by the length of a Line drawn from the Center to the Middle of any one Side, the Product gives the Area.

Because that Line will be equal to the height of each Triangle in the Polygon, and their Bases will be also equal, because they are Sides of a Regular Polygon.

Thus in a Hexagon, whose Side is 8 Yards,



and the Distance from the Center to the Middle of any of the Sides 10 Yards.

The Sum of the Sides is $6 \times 8 = 48$, whose half is 24, which multiplied by 10, produces 240 Yards, the Area of the Hexagon.

7. For all Circles, multiply half the Circumference by the Radius, because every Circle is equal to a Rectangle Δ , one of whose Legs is the Periphery, and the other the Radius, as Archimedes hath demonstrated. For Practice, measure the Semi-diameter, then say, As 1000 : 3141 :: So is the Semi-diameter : To the Circumference : which found, multiply by half the Diameter (or Radius) the Product is the Area.

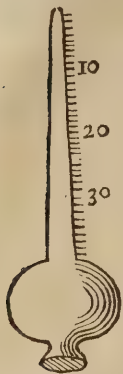
8. For a Sector of a Circle, multiply the Radius, or one of its Legs by half the Arch (or half the Radius by the whole Arch) the Product gives the Content.

9. For all Segments of Circles, find the Area of the Sector inscribing on the Ark, and also the Area of the Triangle, and subtract that of the Triangle from that of the Sector, the Remainder is the Area of the Segment.

10. For an Ellipsis, multiply the longest Diameter by the shortest, and extract the Square Root of the Product, it gives the Diameter of a Circle, whose Area is equal to the Area of the Ellipsis; because the Diameter of such a Circle is a mean Proportional between the Diameters of the Ellipsis.

11. For a Parabola, multiply the entire Ordinate by the Abscissa or intercepted Ax; then double that Product, and divide the whole by 3; the Quotient is the Area.

AREOLA PAPILARIS, a darkish coloured Circle about the Nipple.



AREOMETER, is an Instrument to measure the Gravity of Liquor. 'Tis usually made of a thin fine Glass of this Figure, and sealed at the Top, there being first as much running Mercury put into it, as will serve to keep it swimming in an erect Position. The Stem is divided into Degrees, and by the Depth of its Descent into any Liquor, its Lightness is concluded; for that Fluid or Liquor in which it sinks least, must be heaviest, and that in which it sink lowest, will be lightest.

AREOSTYLE, in Architecture, is a Building where the Columns stand a little too thick, as some say; or as the *French Dictionary of Arts and Sciences* expresses it, *Loin a loin*, that is, at a convenient Distance.

AREOTECTONICKS, is that part of Fortification and Military Architecture which teaches how to attack safely, and to fight an Enemy advantageously.

AREOTICK MEDICINES, are such as open the Pores of the Skin, and render them large enough for the Morbifick Matter to be carried off by Sweat, or insensible Transpiration. *Blanchard*.

ARGEMA, a little Ulcer of the Eye in the Circle of the *Iris*, having its Seat in a part of the White, and also some part of the Black of the Eye. *Blanchard*.

ARGENT, the Name in Heraldry of the white Colours which is used for Gentlemen, Knights and Barons: But Bafons, and all Nobles, have the white Colour called *Pearl*, as all Sovereign Princes have it called *Luna*; Without either this or *Or*, the Herald's say, there can be no good Armory. This is expressed in Engraving, by the Parts being left plain without any Strokes from the Graver.

ARCO NAVIS, a Southern Constellation consisting of 42 Stars.

ARGUMENT, in Astronomy, is an Ark by which we seek another Ark unknown, and proportional to the first; as the

ARGUMENT of INCLINATION, is an Ark of the Orbit intercepted between the Node ascending, and the Place of the Planet from the Sun, being numbred according to the Succession of the Signs.

ARGUMENT of the Moon's Latitude, is her Distance from the *Dragon's Head and Tail*, viz. where the Orbit of the Moon in two Points diametrically opposite, is intersected by the Ecliptick, whereby we find out the Quantity of the real Obscuration in *Eclipses*, or how many Digits are darkened.

ARGYROCOMUS, according to some Writers, is a Silver-coloured Comet differing very little from the *Solar Comet*, except that it is of a brighter Silver Colour, and shines with so great a Lustre that it dazzles the Eyes of the Beholders.

ARIES, a Constellation of Stars drawn on the Globes in the Figure of a Ram: 'Tis the first of the 12 Signs of the *Zodiack*, and is mark'd thus ♈, and consists of 19 Stars.

ARISTA, in Botany, signifies that long slender Needle-like *Beard* which grows out from the Husk of Corn or Grass: By some 'tis called the *Awn*.

ARITHMETICK, is the Art of numbring truly; or, as some define it, the Science of discrete Quantity: 'Tis divided into two general Branches; *Common Arithmetick*, and *Algebra*.

ARITHMETICAL COMPLEMENT, of a Logarithm, is what that Logarithm wants of 10.0000000. That the Arithmet. Complement of 7.1079054 is 2.8920946, where each Figure but the last is taken from 9, and that from 10.

ARITHMETICAL PROGRESSION, or *Proportion*, see the Word *Progression*.

ARK, the same with *Arch*, which see.

ARK of DIRECTION or Progression, in *Astronomy*; is that Ark of the *Zodiack* which a Planet appears to describe when its Motion is forward according to the Order of the Signs.

It is also in the *Ptolemaick System*, the *Ark of the Epicycle*, which a Planet describes when it is *Progressive* according to the Order of the Signs.

ARK of RETROGRADATION, is that which a Planet describes when it is *Retrograde*, or moves contrary to the Order of the Signs.

ARK of the First and Second Station, is the *Ark* which a Planet describes in the former or the latter Semi-circumference of his *Epicycle* when it appears *Stationary*.

ARMARIUM UNGUENTUM, the same with the *Hyplo*, *Chryisma*, *Magnes Microcosmicus*; or a Weapon Salve; whereby Wounds, as they pretend, may be cured at any distance, by dressing the Weapon only. They prescribe it to be made of the Flesh of a Man hanged, or which died some such violent Death, at the Increase of the Moon; and in a good Sign, &c. according to the foolish and wicked Superstition of Astrologers. See a good Refutation of this Imposture, and of the Arguments brought for it, by the Author of *Philosophie Mosaicque*, in *Athani. Kircher de magnete, Lib. 3. pars vii.*

ARMED, is said at Sea of a Man of War fitted out and provided in all respects. Also a *Cross-Barr-Shot* is said to be *Armed*, when some Rope-Yarn, or the like, is rowled round about one end of the Iron-Barr which runneth thro' the Shot, both that the Shot may be the better rammed down into the Gun; and also chiefly, lest the sharp end of the Bar should catch into any *Honey Combs* within the Cylinder of the Piece.

A Load-stone is also said to be *Armed*, when it is capped or cased, or set in Iron; in order to make it up the greater Weight, and also to distinguish readily its Poles. *Kircher*, in his Book de *Magnete*, tells us, That the best way to arm a Loadstone, is to drill a Hole thro' the Stone from Pole to Pole, and in that to place a Steel Rod of a moderate length; which Steel Rod will, he saith, at the end, take up more Weight, than the same Stone armed the common way can do; as he saw tried at *Rome*.

ARMED, is the proper Term in Heraldry for Blazoning the Beaks and Feet of Cocks, and all Birds of Prey; and these are always painted of a different Colour from the Bird it self, and therefore they say he beareth a Cock, or a Falcon *Armed Or, Gules*, &c.

ARMILLARY SPHERE, is when the greater and lesser Circles of the Sphere being made of

Brass, Wood, Past-board, &c. are put together in their natural Order, and placed in a Frame, so as to represent the true Position and Motion of those Circles.

See the Figure following.



ARMONIACK. SALT, see *Sal Almoniack*.

ARMONIACK Volatile Spirit, see *Volatile Spirit of Sal Armonick*.

ARMORY, the same with *Heraldry*, being the Art of truly *Blazoning* and *Marshalling* all Coats of Arms, and appropriating them to their proper Bearers.

AROMATICK, the same with *Oloriferous*, or *Sweet Scented*.

AROMATICK Volatile Salt, the same with *Sal Volatile Oleosum*, which see.

AROMATIZATION, or *Aromatizing* of Medicines, is mingling them with a due Proportion of *Aromatick Spices, &c.* in order to make them more grateful and useful.

ARQUEBUSE, or *Harquebuss*, is a large Hand-Gun something bigger than our *Musquet*; by some 'tis called a *Caliver*.

ARRAIGN, is to put a thing in order, or in his Place.

ARRAIGNE the *Affize*, is to cause the Tenant to be called, to make the *Plaint*, and to set the Cause in such order as the Tenant may be enforced to answer thereto.

Also a Prisoner is said to be *arraign'd*, when he is indicted and put to his *Trial*.

ARRAY, (in Law) is the ranking or ordering a Jury or Inquest of Men that are *Impannelled* upon any Cause.

ARRENTATION, signifies the licensing an Owner of Lands in the Forest to enclose them (with a Hedge and a little Ditch) under a yearly Rent.

Saving of the Arrentation, is the saving Power to give such Licences for a yearly Rent.

ARRERAGES, are Duties behind unpaid after the Days and Times in which they are due, and ought to have been paid, whether they be Rents of a Mannor, or any other thing reserv'd.

ARREST, is when one is legally taken and restrain'd from his Liberty.

ARRESTANDIS bonis ne dissipantur, is a Writ which lies for him whose Cattel or Goods are taken by another, who, during the Controversy, doth, or is like to waste or consume them, and will hardly be able to make Satisfaction for them afterwards.

ARRESTANDO ipsum qui pecuniam recepit ad proficiendum in obsequium Regis, &c. is a Writ that

lieth for the Apprehension of him that hath taken *Prest-money* towards the King's Wars, and hides himself when he should go.

ARRESTO factio super bonis mercatorum alienigenorum, is a Writ that lies for a *Denizon* against the Goods of Strangers of another Country, found within the Kingdom, in Recompence of Goods taken from him in that foreign Country, after denial of Restitution. This, among the *Civilians*, is called *Clarigatio*, but now barbarously *Reprisatio*.

ARRETTED, (in Law) is he that is convicted before any Judge, and charged with a Crime.

ARRIERE-GARDE, see *Rear-Guard*.

ARSENAL, is a Royal or Publick Magazine, or Place appointed for the making and keeping of all Arms necessary either for Defence or Assault.

ARSIS & THESIS, are certain Terms in Musical Composition; as where a Point being inverted, is said to move *per Arsin & Thesis*, that is to say, where a Point riseth in one part, and falls in another; or on the contrary, where it falls in one part, and riseth in another; whence is produced a very agreeable Variety.

ARTERY: There are three kinds of Ducts in an Animal Body which bear the Name of *Artery*, the *Asperia Arteria* or *Trachea*, the *Arteria Pulmonaris* or *Vena Arteriosa*; both which see: And most properly, the *Aorta* or great *Artery*, which carries the Spirituous Blood from the left Ventricle of the Heart by its Branches, to all Parts of the Body; This, and its Ramifications, are the only true *Arteries*. The Word *Artery*, some say, is derived from *ἀρό τῆ ἀρτην*, because 'tis continually rising or moving with a Pulse like Motion; and may be defined to be an Organical and Similar Part, oblong and round, appointed to convey Spirituous Blood to all Parts of the Body.

The greatest *Aorta* in the whole Body is the *Aorta*, for that Reason often called the *Arteria magna*; and from it all the *Arteries* in the whole Body are derived, except the *Arteria Pulmonaris*. A brief Account of which, and how they spring from the *Aorta*, I shall here subjoin.

Before it comes out of the *Pericardium*, it sends out sometimes one, but oftner two small *Arteries*; on each side one, which compass the *Basis* of the Heart like a Garland in their Circuit, sending down divers Twigs lengthways on the Heart; and these are called the *Arterie Coronarie*. When these two small *Arteries* have encompassed the *Basis* and meet, they inosculate one with another, but not with the *Veins*: At their rise out of the *Aorta*, there is a Valve to hinder the Reflux of the Blood into the *Aorta*. These Coronary *Arteries* Dr. *Ruych* observes, send Branches to the *Auricles*, and to the very Substance of the Heart it self, and to the Root of the Trunk of the *Aorta*.

The ascending Trunk then running up under the *Vena Cava*, lies upon the Wind-pipe, and presently sendeth forth two large Branches, whereof one passeth to the Right, the other to the Left Arm: They are called *Rami subclavii*, because they march under the *Clavicule*; and as soon as they are gone out of the Breast, are called *Axillares*. The Right is the larger, and rising higher, goes a more direct way towards the Right Arm; the Left is less, and rising lower, ascends more obliquely towards the Left Arm. They send
out

out several Branches both from their lower and upper side.

From the Lower proceeds the *Superiour Intercostal*, which runs along the Interstices or Intervals of the four uppermost Ribs, and sends Slips to the neighbouring Muscles and spinal Marrow. These sometimes are propagated from the Cervical Arteries coming out thro' the Holes of the *Vertebrae*.

From the upper side of each *Subclavian* springs first the *Mammari*, which descends towards the Breast thro' the Muscles that fill up the Interstices of the Cartilages of the true Ribs; and a considerable Branch of each descending out of the *Thorax* by the Sides of the *Cartilago enfformis*, run down the *Abdomen* under the *Musculi Recti*, spreading there into many Twigs, which are said to inoculate with the Extremities of the like Twigs of the *Epigastrick Artery* ascending. But that Opinion is so opposite to the Circulation of the Blood, that it is impossible to be true; for no Blood can ascend by the *Mammariæ*, nor descend by these ascending Twigs of the *Epigastricæ*.

The next is *Cervicalis* (otherwise called *Vestibralis*) which sendeth Slips to the *Vertebrae* and Muscles of the Neck, at whose seventh *Vertebra* it enters in by the Holes of the transverse Processes, and pierceth the Membrane that invests the Spinal Marrow, bestowing Twigs both on the Membrane and Marrow, and runs up therewith in at the great Hole of the *Occiput*, and being enter'd the Skull, both Branches (the Right and Left) join under the *Medulla Oblongata*, and then are divided into innumerable most small Twigs, which make wonderful Net-like Plexus in the *Pia Mater* about the *Cerebellum*, and run into the Substance of the *Cerebellum* it self; and some of them being united with those of the *Carotides*, make part of the very *Rete mirabile*.

The third *Artery* that riseth out of the upper side of the *Subclavian* is *Muscula*, which is spent on the Muscles of the Neck, and sometimes also on some of the Arm.

After the *Subclavians* have had all these Pairs of Arteries going out of them, they pass out of the *Thorax*, and begin to be called *Axillars*.

At the same Place, or very near, where the ascending Trunk of the *Aorta* sends out the *Subclavians* sideways, the remainder of it is divided into two, called *Carotides*, which ascend directly upwards (tho' the Right sometimes arise from the right *Subclavian*.) These, at their rise, are sustained by the *Thymus*; and having bestowed Twigs on the *Larynx*, *Tongue*, the Muscles of the *Os Hyoides*, and the neighbouring Gland, pass up on each Side by the sides of the Wind-pipe to the Jaws, with the Internal Jugular Vein, and there are each subdivided into the *External* and *Internal* Branches.

The *External* is smaller, and is dispersed into all the Muscles of the Cheeks, Fore-head, Temples, Lips, and, in general, thro' all the outer Parts of the Head and Face.

The *Internal*, which is larger, sends forth some more Twigs to the *Larynx*, *Tongue*, &c. as also to the Glands behind the Ears, and the spongy Parts of the Palate and Nose. Then it entereth the upper Jaw, and bestows a small Slip on the Root of each Tooth (as the *External* did on the

Roots of the Teeth of the lower Jaw) whereby sharp Humours flowing in upon them, sometimes cause a very painful Tooth-ach. The remainder of it climbs upon the Skull, being about the *Basis* divided into two Branches: The *less* and hinder whereof having sent one Slip to the inner Muscles of the Neck, and another thro' the Hole of the uppermost *Vertebra* into the Membrane that invests the Spinal Marrow, ascending farther, enters the Skull, at the Hole by which the sixth Pair of Nerves (commonly so called) comes out, and creeping along the *Dura Mater*, ends near its *Sinus* (which yet some say it enters.) The larger Branch, tending upwards, is carried thro' the bony Channel in the Wedge-like Bone, with a winding Duct to the *Sella equina*; at whose *Basis*, after it has sent out a Twig on each Side into the *Dura Mater*, it opens it self into many small Slips, which being interwoven with those of the Cervical Artery (above-mentioned) make the *Rete mirabile*, which is more observable in Beasts than in Men. Yet it is not all spent on the said Slips, but perforating the *Dura Mater*, it enters the *Pia Mater* with two notable Branches, which being divided into very small Twigs, are mingled with those of the Cervical Artery, with which they pass out of the Skull, and accompany the Spinal Marrow even to the Loins: Afterwards it sends a small Branch thro' the second Hole of the Wedge-like Bone with the Optick Nerve, out of the Skull to the Eye; and yet still supplying more Twigs to the Substance of the Brain and *Pia Mater*, and being united with some other Twigs of Cervical Artery, it makes the *Plexus Chorooides*.

The descending Trunk of the *Aorta*, which is larger than the ascending, goes down by the Gullet to which it cleaveth. And hence is a Man that is hot, so much cooled with a draught of cool Drink; for the Gullet being cooled thereby, the Blood in the *Aorta* contiguous to it, must needs be cooled likewise.

Before it arrive at the *Diaphragm* it sends out of its hinder side the *Inferiour Intercostals*, which run along the Interstices of Eight or Nine of the lower Ribs, namely, those which the *Superiour Intercostals* did not supply. They likewise send Sprigs by the Holes of the *Vertebrae*, made for the Nerves, to the Marrow of the Back, and to the Muscles which rest upon the *Vertebrae*, and also to those of the *Thorax*. Sometimes above this, and sometimes below it, there ariseth also out of the hinder part of the *Aorta* and Artery called *Bronchialis*, first found out and so named by *Frederick Ruysch*, which accompanies all the *Bronchia* of the Wind-pipe.

When it comes to the Midriff, there springs out of it the *Phrenicæ*, one on each side; these running all thro' the *Diaphragm*, pass up into the *Mediastinum*, and sometimes into the *Pericardium*.

Then having penetrated the Midriff it descends in one Trunk to the fifth *Vertebra* of the Loins; in which Passage it first sendeth forth the *Celiacæ*, which ariseth single, and is so called, because it sendeth Twigs to the Stomach. This springeth from the fore-part of the Trunk at the first *Vertebra* of the Loins, and descending under the hollow of the Liver, upon the Trunk of the *Vena Porta*, it is divided into two Branches, the *Right* and *Left*.

The *Right* which is the smaller, ascending, produces in its upper part the *Gastrica dextra*, that comes

comes to the *Pylorus*, whence *Spigelius* calls it *Pylorica*: And besides, the *Cystica gemella*, which are very small, and are dispersed thro' the Gall-Bladder. And out of its lower side there spring;

1. *Epiplois dextra*, which runs thro' the right side of the inner or hinder Leaf of the Caul and the Colon that it is annexed to.

2. *Intestinalis*, bestow'd on the *Duodenum* and beginning of *Jejunum*.

3. *Gastro-epiplois dextra*, on the right side (to the middle) of the bottom of the Stomach, and also on the Caul that it is knit to its bottom.

4. *Hepatica*, which are two small ones: These are spent on the investing Membrane of the Liver (for its *Parenchyma* is nourished by the *Porta*) the *Capsula Communis*, the Gall-Bladder and *Porus Biliaris*.

The Remainder of this Right Branch enters the Mesentery with many Twigs.

The Left Branch of the *Celiaca*, which is call'd *Splenicus* (sometimes springing immediately from the *Aorta*) is larger than the Right; and as it goes towards the Spleen, it sendeth forth of its upper side *Gastrica major*, which after it hath bestow'd a Slip upon the upper and middle part of the Stomach, is divided into two others; the first whereof is called *Coronaria Stomachica*, which encompasses the upper Orifice of the Stomach like a Garland, and sends many Twigs to the Body of the Ventricle it self; the other *Gastrica sinistra* which (according to *Diemerbroeck*) is carried towards the Right Hand into the upper part of the Stomach, and to the *Pylorus*. Out of its lower side spring, first *Epiplois postica*, which runs to the hinder Leaf of the Omentum, and the Colon annex'd to it; secondly, *Epiplois sinistra*, which is bestow'd on the lower and left side of the Omentum.

Just as the *Splenicus* Branch is entering into the Spleen, there arises out of its upper part *Vas breve arteriosum*, which goeth straight to the Left part of the bottom of the Stomach; and the *Gastro-epiplois sinistra*, which being sustain'd by the upper or fore-leaf of the Omentum, sends some Twigs thereto, and also to the Left part of the bottom of the Stomach, and to both its fore and hinder sides, then it enters into the Spleen.

All these Arteries spring from the *Celiaca*, and accompany the Veins of the *Porta* of the like denomination.

The next that ariseth out of the Trunk of the *Aorta* is the upper Mesenterick, which springs from the fore-part of it as the *Celiac* did. It accompanies the *Vena Mesariaca* of the *Porta*, and runs thro' all the upper part of the Mesentery, and bestows many Branches on the Guts, *Jejunum Ileum*, and that part of Colon that lieth in the right Hypochonder.

Immediately below this, about the second *Vertebra* of the Loins, there go out of each side of the descending Trunk of the *Aorta* an Emulgent Artery, each of which being after its rise divided into two, and sometimes into three Branches, enters the Kidney on its own side. The Right springs out of it a little lower than the Left: both are subdivided into innumerable Twigs in the *Parenchyma* of the Kidneys, (all of which are invested with the Veins in one common *Capsula* borrow'd from the Pelvis) and their Capillaries end in the Glands, wherein the Serum that these Arteries bring with the Blood is separated there-from, and carried from them by the Urinary Siphons into the Pelvis.

Next to these arise the *Spermatice* (called *Arteriae preparantes*). These go out of the fore-part of the Trunk very near together (very seldom either of them out of the Emulgents, as the Left *Spermatick Vein* does) and the Right passes over the Trunk of the *Vena Cava*: About 2 Fingers breadth from their rise they are each joyn'd with the *Vena preparans* of their own side, and descend with them, in Men, thro' the Process of the *Peritoneum* to the Stones, being divided into two Branches a little before they arrive at them, one of which runs towards the *Epididymis*, and the other to the *Testes*. In Women, when they come near the *Testes* (or *Ovaria*) they are divided also into two Branches, one whereof goes to the *Testes*, and the other to the bottom of the Womb. Next below the *Spermatick* springs the lower Mesenterick out of the Trunk a little before it is divided into the *Rami Iliaci*. This entrench the lower Region of the Mesentery, and distributes many Branches to the Left part of the Colon, and to the freight Gut; and lastly, descending to the *Anus*, makes the internal Hemorrhoidal Artery.

Very near to this, out of the Trunk still arise the *Lumbares*, reckon'd four in number: These go out of the back-side of the *Aorta*, and are distributed, not only to the neighbouring Muscles of the Loins, and to the *Peritoneum*, but enters in at Holes of the *Vertebra* of the Loins, and run along the Membrane that involves the Spinal Marrow, and penetrates into the Marrow it self.

Besides these some reckon other two, on each side one, call'd *Musculæ Superiores* (which run to the Muscles of the Abdomen) unless these be two of the four call'd *Lumbares*.

When the Trunk is descended as low as the fifth or last *Vertebra* of the Loins, and the top of *Os Sacrum*, it begins to climb upon the *Vena Cava*, under, or behind which it passed thus far: But as it begins to get upon it, it is divided into two equal Branches call'd *Rami Iliaci*, and at its very division there springs out of it *Arteria Sacra*, whose small Twigs entering in at the Holes of the *Os Sacrum* penetrate into the Marrow contained in it.

The Trunk of the descending *Aorta* being divided into the *Rami Iliaci*, these are sub-divided presently into the *interiour* and *exteriour* Branches. From the *interiour*, which is less, proceed three others.

First, The *inferiour Muscula* (called otherwise *Glutea*) which is bestow'd on the Muscles, named *Glutei* that makes the Buttocks, and also on the lower end of the Iliack Muscle and the *Pseas*.

Secondly, The *Hypogastrick*, which is large, and at the lower end of the *Os Sacrum* runs to the Bladder and its Neck, and the Muscles that cover the *Ossa Pubis*. In Men it goes also along the two Nervous Bodies of the *Penis* as far as the *Glans*; and in Women it is distributed in numerous Branches into the bottom of the Womb and its Neck, out of which, for the greatest part, issue the *Menses* in their Monthly Purgation. It goes also to the *Podex*, where it makes the external Hemorrhoidal Artery.

Thirdly, The *Umbilical Artery*, which ascending by the sides of the Bladder, and being inserted into the *Peritoneum*, proceeds betwixt the two Membranes thereof to the Navel, out of which it passes in a *Fetus* in the Womb, and runs into the *Placenta Uterina*: But after the Infant is born, when there is no more use of it, it closes up, and turns into

into the nature of a Ligament, in some measure sustaining the sides of the Bladder, and hindring it from pressing on its Neck.

From the *Exterior Branch* of the *Ramus Iliacus* two Arteries arise.

First, The *Epigastrick*, which turning upwards on the outside of the *Peritonæum* runs betwixt it and the *Musculi Recti* of the *Abdomen* as high as the Navel, where the Mammary Artery meets it, and according to Tradition (tho' false) inosculates there with it.

Secondly, *Pudenda*, which sends forth a notable Artery on each side into the Nervous Body of the *Penis* in Men, and into the *Clitoris* in Women. Hence it is carried inwards by the joyn'ting of the *Ossa Pubis* to the *Pudenda* and Groins, and their Glands, and is spent on the Skin of those Parts, and of the Yard, in Men. When all these pairs of Arteries have arisen out of the *Rami Iliaci*, they run down out of the *Abdomen* to the Thighs, where they begin to be called *Cruvales*.

ARTERIA VENOSA: See *Pulminaria Arteria*.

ARTERIOTOMY, is the artificial opening of an Artery for the letting of Blood in an inveterate Head-ach, Madnefs, Falling-sicknefs, Pain and Inflammation in the Eyes and Ears, and the Section is made in the Fore-head, Temples, or behind the Ears: The manner of it is thus; after the Ligature is made in the Arms or Neck, the Artery is cut just as a Vein is, and when the Blood is emitted, you apply a very Astringent Plaister with a Leadn Plate to the Orifice, and then swathe it well. *Blanchard*.

ARTHRITIS, *Morbus Articularis*, the Gout, is a Pain in the Joints of the Limbs, sometimes accompanied with a miserable Contraction of the Nerves, Tendons, Ligaments, and thin Membranes about the Bones, with Swelling and Rednefs, and now and then with hard chalky Concretions. They account it four-fold: *Cyragra* the Hand Gout; *Ishias*, the Gout in or about the Bone connected to the *Os Ilium*, which therefore some call the Hip-Gout; *Gonagra*, in the Knees; and *Podagra*, in the Feet.

ARTHRITIS PLANETICA, } the wandering
ARTHRITIS VAGA, } Gout, which
flies or moves from one Limb to another.

ARTHRITICK, or *Arthritical*, Gouty, Dis-eased in the Joints, &c.

ARTHRODIA, is the Articulation of one Bone into the shallow *Sinus* of another, as the *Radius* receives the *Humerus*.

ARTHROSIS, the same with *Articulation*.

ARTICK POLE, is the North Pole of the World.

ARTICK CIRCLE: See *Polar Circle*.

ARTICLE, in Arithmetick, is *Ten*, with all other whole Numbers that may be justly divided into ten Parts, as 20, 30, 40, &c. they are sometimes called *Decads*, and sometimes Round Numbers.

ARTICLE, in Grammar, is a small Word or Particle used to Decline or Vary the Cases, and to distinguish the Genders of Nouns and Pronouns, as *Hic*, *Hec*, *Hoc* in the Latin Tongue.

ARTICULATION, is that part of Grammar which treateth, first of Sounds and Letters (which are called the Elements of Speech) and then of the manner of their Combination for the composing of Syllables and Words; so that he which

pronounces his Words clearly and distinctly, is said to pronounce them *articulately*. And such Sounds as can be expressed by Letters, and which form Words, are called *Articulate Sounds*.

ARTICULATION, in Anatomy, is a Conjunction of the Limbs of an Animal Body, for the due performance of Motion: Some make this twofold, *viz.* *Diarthrofsis*, which is a more loose, and *Synarthrofsis*, which is a more close Conjunction.

The Term is also used by the *Botanists* for the Joints or Knots that are in some *Siliques*, as those of the *Ornithopolium*, and in the Roots of the *Polygonatum*, and the Distance or Space between Knot and Knot, or Joint and Joint they call the *Internodium*.

ARTIFICIAL DAY: See *Day*.

ARTIFICIAL NUMBERS, *Secants*, *Sines* and *Tangents*: See *Logarithmetical Numbers*, *Secants*, *Sines* and *Tangents*.

ARTIFICIAL LINES, on any Sector or Scale are Lines so contrived as to represent the Logarithmetick *Sines* and *Tangents*, which, by the help of the Line of Numbers, will solve all Questions in Trigonometry, Navigation, &c. tolerably exact.

ARTILLARY, is all sorts of great Fire-Arms with their Appurtenances; as Cannons of all sorts, Mortars, Muskets, Carbines, &c.

ARTYÆNOIDES, or *Cuturales*, are two Cartilages which with others make up the top of the *Larynx*; and these are so called, because when their Processes are joined together, they represent the Month of an Ewer (*Gutturium*) or the indented Lip of a Cup or Vessel.

ARTYÆNOIDEUS, is the smallest Muscle belonging to the *Larynx*; it's in the Opinion of some, double; but has always (says Mr. Cowper) appeared to us single. It arises from the external part of one of the *Artenoidal Cartilages*, and running transversly, is inserted to the other. This pulls the *Artyenoidal Cartilages* nearer each other, and shuts the *Rimula* adequately, by forcing down the *Epiglottis*, which quite closes the *Glottis* so that no Air can enter.

ASAPHY, is a lownefs of the Voice, proceeding from an ill Constitution, or Contemperation of the Organs of Speech.

ASBESTINE Paper or Cloth, is such as will burn in the Fire, be purified by it, and yet not consume. 'Tis made of the *Asbesto* or *Lapis Amianthus*, and is by some called *Linum Vroom*.

ASCARIS, or *Ascarides*, are little Worms which breed in the *Intestinum Rectum*, and tickle and trouble it.

ASCENDANT, is that part of the Heavens which ascends, or is coming up above the Horizon in the East.

ASCENSION, is the rising of the Sun or Star, or of any part of the *Equinoctial* with it, above the *Horizon*. *Descension* is the setting of the same. These *Ascensions* and *Descensions* are either *Right* or *Oblique*; which see.

ASCENSIONAL Difference, in Astronomy, is the Difference between the *Right* and *Oblique Ascension* or *Descension*; or, it's the space of Time, the Sun riseth or setteth before, or after six of the Clock.

To find the *Ascensional Difference* Trigonometrically, having the Latitude of the Place, and the Sun's Declination given.

Say, As the Co-Tangent of the Latitude : Is to the Tangent of the Sun's Declination :: So is the Radius : To the Sine of the *Ascension Difference*.

Example. Suppose the Latitude be $51^{\circ}.30'$. and the Sun's Declination be $9^{\circ}.00'$.

Then to the Ar. co. of the }
Co-Tangent of $51^{\circ}.30'.$ -- $0,099395$
add the Tangent of $9^{\circ}.00'.$ -- $9,199712$
Sum is the Sine of $11^{\circ}.29'.$ -- $9,299107$

Which is the *Ascensional Difference* required ; and being reduced into Time, by allowing 4 Minutes of an Hour for every Degree, 'twill be $44^m.29^s$.

ASCII, are the Inhabitants of the *Torrid Zone*, which twice a Year have the Sun (at Noon) in their *Zenith*, and consequently, then their Bodies cast no Shadow ; whence comes the Name of *Ascii*, ἀσχοι.

ASCITES, is a Dropfic or swelling of the *Abdomen*, and consequently, of the *Scrotum*, Thighs and Feet, proceeding from a Serous, and sometimes Lymphatick or Chylous Matter, like the washing of Flesh, collected in the Cavity of those Parts.

ASCITICK, is he that is affected with the *Ascites*.

ASCLEPIAD, a Greek or Latin Verse of four Feet, containing a Spondee, a Coriambus, and two Dactyles ; as,

Sublimi feriam sidera vertice.

ASPARAGUS, in Botanicks, signifies the first *Germen*, Sprout or Shoot of a Plant ; which is either edible by it self, or boiled in Broth : It comes out before the Leaves are unfolded. And hence (*i. e.* ἀσπράγος) the famous Plant of this Name receives its Denomination.

ASPECT, a Term in Astronomy, signifying the Situation of the Stars and Planets, in respect of one another. Of these they usually reckon five.

1. The *Sexile*, when two Stars or Planets are 60 *degr.* from one another.
2. *Quartile*, when they are 90 *degr.* distant.
3. The *Trine*, when they are distant 120 *Degr.*
4. *Opposition*, when they are 180 distant.
5. *Conjunction*, when they are both in the same Degree.

Kepler added 8 new *Aspects* more ; as the *Demi-sexile* of 30° . the *Decile* of 36° . the *Octile* of 45° . the *Quintile* of 72° . the *Tredecile* of 108° . the *Sextantile* of 135° . the *Biquintile* of 144° . and the *Quinticinx* of 150° .

How the Distance is reckoned, and on what Circle, see the Word *Secondary Circles*.

ASPERSA Arteria, or Trachea, is an oblong Pipe consisting of various Cartilages and Membranes, which begins at the Throat, or lower part of the Jaws, lies upon the Gullet, descends into the Lungs, and is dispersed by manifold Ramifications or Branches thro' their whole Substance : The upper Part is called *Larynx*, and the Lower *Bronchus*, to which *Malpighius* adds a third, or lowest, called by him *Vesicular* : It is subservient to Speech and Respiration.

That part of the *Aspera Arteria* which is called the *Bronchus*, contains all of it, but the *Larynx* ; being the Body of the Pipe as well before as after its Insertion into the Lungs, all the Cartilages of this *Bronchus* are like the lowest of the *Larynx*, to which the uppermost of the *Bronchus* adheres.

These Cartilages are seated one below another at equal Distances, and keep in their Places by both the Membranes of the *Trachea*, which fill up their Interstices, and tie them one to another like Ligaments. Yet these Rings have not their Circle entire, but on the backside of the *Bronchus* next the Gullet, that they might give way to the Meat in swallowing, they pass into a Membrane, so that they are in Figure like the Letter C. But this Interstice in their Circle, which most Anatomists affirm to be Membranous, *Casp. Bartholin* (after his Father) says, is rather a Carnous Fibres that run from one Side or End of the Cartilage across to the other, which, in Expiration (especially violent) contracting themselves, draw the Ends of the Cartilage towards one another on each Side, and thereby straiten the Pipe of the *Trachea*.

And tho' the Cartilages, so far as they are contiguous to the Gullet (being about twenty in number) are thus femilinear as it were ; yet those of the Branches of the *Bronchus* within the Lungs, have no Interstice in their Circumference, being all Cartilaginous, tho' not all of a Circular Figure, but some Four-square, other Triangular, &c. as *Diemerbroeck* observes, the inner Membrane is plentifully beset with military Glands, out of which a good part of that mucous Matter that bedaubes its Inside issues, for the lubricating of it. The outer Membrane helps to connect the Cartilages the more firmly one to another, and the whole *Trachea* to the neighbouring Parts, that it may more safely and firmly descend into the *Thorax*. This is much thinner than the other ; for the Inner (according to *Dr. Wallis*) has two Rows of Muscular Fibres, the Outer straight, the Inner Oblique, the First by their Contraction shorten the *Trachea*, the Latter straiten it ; so that he thinks they assist Expiration, especially when it is violent, as Coughing, Hawking, or the like. Yet he says, this inner Membrane has two others growing upon it, as it were, one Glandulous, and another Vascular. Thro' this latter do the Blood-Vessels and Nerves every where run ; and the Glands placed in the former, receive and keep all the superfluous Moisture or *Lympha* deposited by the Arteries, which the Veins do not imbibe, till they can remand it by the Lympheducts (which spring from them) or if it be over plentiful, so that the Lympheducts cannot receive it at all, then it issues both out of these Glands, and out of the Arteries into the Cavity of the Wind-pipe, and causes a Catarrh. But the Inside of this Membrane is naturally moist, being besmeared with a fattish and mucous Humour, to hinder its drying, and to make the Voice smoother ; so that when this Humour is fretted off in Catarrhs, or the Inside of this Membrane becomes rough from any Cause, the Voice becomes hoarse ; and when it is dried by too much Heat, as in Fevers, it becomes squeaking.

The *Aspera Arteria* has Veins from the external Jugulars. Arteries from the *Carotides*, and from the *Arteria Bronchialis* (first found out by *Frederick Ruysch*) which springs from the backside of the descending Trunk of the *Aorta*, a little above the lower Intercostals. Nerves it receives from the recurring Branches of the *par Vagus*, which run mostly along its inner Membrane, whence it becomes so exquisitely sensible.

When it is descended as low as the fourth *Vertebra* of the *Thorax*, it is divided into two Trunks, whereof one goes into the right Lobe of the Lungs, the

the other into the left, and each is presently again divided into two, and those into others, till at last they end in very small Branches, which are dispersed among the like Branches of the Pulmonary Artery and Vein, and end in and are continued with the little Bladders that make up the greatest part of the Bulk of the *Lungs*.

ASPERIFOLIÆ (*Plantæ*) is one of the Divisions or kinds of Plants : See (*Plants*, N. II.)

In this kind of Plants, the Leaves stand alternately, or without any certain order on the Stalks : The Flowers are *monopetalous*, but having the Margin cut into 5 Divisions, sometimes deep, sometimes shallow ; and the upper Spike or top of the Plant is often curved back something like a Scorpion's Tail. They are called *Asperifoliæ* because they are usually *rough leaved*, but they are not always so. After each Flower of this kind of Plants, there usually succeed four Seeds : There being only the *Cerintæ* reckoned by Mr. Ray to belong to this Genus, which hath less than four Seeds at the Root of each Flower, but that hath but two.

The Herbs *Asperifoliæ* are, the *Pulmonaria Maculosa*, *Gynoglossa*, *Borago*, *Buglossa*, *Anchusa*, *Echium*, *Linum Umbilicatum*, *Heliotropium majus*, *Aparine major*, *Consolida major*, *Lithospermum*, *Echium Scorpoides* and *Cerintæ*.

ASPERITY, is the inequality or roughness of the Surface of any Body, whereby some parts of it do so stick out above the rest, as to hinder one's Hand, &c. from passing over it easily and freely.

ASPHYXIA, or a Cessation of the Pulse of the whole Body, is the highest degree of Swooning, and next to Death.

ASPIRATION, or the pronouncing of any Syllable or Word strongly, with a good deal of Breath and some Vehemency ; as we do those Words which have the Letter *H* before them, as *have*, *bear*, *hear*, &c. whereas they are sounded much softer and easier without the *H* ; as *ear*, *eat*, &c.

ASPHYXIA, a sensible decayed Pulse, the same with *Asphyxia*.

ASSART, a Term in Law, signifying an Offence committed in the Forest, by plucking up the Woods by the Roots : Also to make Glades in a Wood, to grub up or clear a Ground of Bushes and Shrubs, &c. or to lop off the Boughs of a Tree.

ASSATION, is a Term in Pharmacy, used for a peculiar kind of Decoction or Boiling of Plants, &c. in their own Juice.

ASSAULT (in Law) signifies a violent kind of Injury offered to a Man's Person, of a more large extent than Battery ; for it may be committed only by offering to give a Blow.

ASSAULT (in the Art of War) is taken also for a general Attack made upon the Fortrels to get it by main Force, without defending themselves in the Attack by any Works : The Words are, to give an *Assault* to such a Place ; to be commanded to the *Assault* ; to stand an *Assault*, to second an *Assault* ; to repulse an *Assault* ; to carry by *Assault*, &c. While an Assault lasts, and both Parties are mixt, there is no fear of Cannon on either Side, for they are afraid of destroying their own Men thereby.

ASSETS (in Law) signifie Goods enough to discharge that Burden which lies upon the Executor or Heir, in satisfying the Testators or Ancestors Debts or Legacies.

ASSEWIARE, signifies to draw or drain out Water from a Marshy Ground.

ASSIGN, (a Law Term) is he that is appointed or deputed by another to do any Act, or perform any Business, or enjoy any Commodity : And it is either in *Deed* or in *Law*.

ASSIGN in *Deed*, is he that is appointed by the Person himself.

ASSIGN in *Law*, is he whom the Law so makes, without any appointment of the Person.

ASSIMILATION, is a Term in Anatomy, by which they express the Change that is made either of Chyle into Blood, or of the Nutritious Juice into the Substance of an Animal Body. Thus the Modern Anatomists say, Sanguification is not performed by the Liver only, as the Ancients supposed, but by a gradual changing of the Chyle into Blood by frequent Circulations, and the manner of this Change they call *Assimilation*.

ASSISA *Cadere*, in Law, signifies to be Non-suited.

ASSISA *Nocumenti*, an Affize of Nuisance.

ASSISA *Continuanda*, is a Writ directed to the Justices assigned, to take an Affize for the continuance of a Cause, where certain Records alledged cannot in time be procured by the Party that would use it.

ASSISA *Proroganda*, is a Writ directed to the Justices of Affize for the stay of Proceedings, by reason of the King's Business, wherein the Party is employed.

ASSISE, *de mort d'ancestors* : See *Cofinage*.

ASSISE *de utrum*, lieth for a Parson against a Lay-Man, or a Lay-Man against a Parson, for Land or Tenement doubtful whether it be Lay-fee, or Free-Alms.

ASSIZE, in Law, properly signifies a Writ that lies where any Man is put out of his Lands, Tenements, or of any Profit to be taken in a certain Place, and so disseised of his Free-hold. In an *Affize* it is needful always that there be one Disseisor, and one Tenant, or otherwise the Writ shall abate.

There is also another *Affize*, called *Affize of fresh Force*, and lies where a Man is disseised of Tenements which are devisable ; as in *London* or other Boroughs that are Franchises : For there the Tenant shall come into the Court of the Town or Borough, and enter his Plaintiff, and accordingly shall have a Writ directed to the Mayor or Bayliffs, &c. and thereupon shall pass a Jury in manner of *Affize of Novel Disseisin* ; and in case the Officer delay Execution, the Plaintiff shall have another Writ of Execution, then a *fiat alias*, and after that a *Pluries*, &c. And from things of this Nature being done by the Judges in their Circuits ; when at any Place they sit to do Justice by Commission, that Court or Meeting is called the *Affizes*.

But besides this, the Judges of the *Affizes* have several other Commissions ; as, 1. A Commission of Oyer and Terminer, directed to them, and to many others of the best Account in their Circuits ; but here the Judges are of the *Quorum*, so as without them there can be no proceeding : By this Commission they enquire into and punish Murders, Treasons, Felonies, &c. 2. They have a Commission of Goal Delivery ; this is directed only to themselves, and the Clerk of the Affize Associate ; and by this Commission they deal with all Prisoners in Goal, for whatever Offences there committed. 3. They have also a Commission of Nisi

Prius, directed to the Judges themselves and the Clerk of the *Affize*, by which they are commissioned to take *Nisi Prius*, &c. 4. They have also a Commission of the Peace, in which all the Justices of the Peace of the several Circuits are obliged to assist them; for Default of which they are fineable at the Discretion of the Judges.

ASSIZE *de darraïn Presentment* : See *Quare impedit*.

ASSIZE of *Novel Disseisin*, lies where a Tenant in Fee-simple, Fee-tail, or for term of Life, is lately disseised of his Lands or Tenements, or else of a Rent-service, Rent-feeke, or Rent-charge of Common, of Pasture, of an Office, &c.

ASSIZE of the *Forest*, is a Statute or Condition, touching Orders to be observed in the King's Forest.

ASSIZE of *Bread and Beer*, is the Power a Magistrate has of affizing or adjusting their Weights and Measures.

ASSOCIATION, is a Patent sent by the King, either of his own Motion, or at the Suit of the Party Plaintiff to the Justices of *Affize*, to have other Persons associated to them to take the *Affize* : And upon this Patent of the Association, the King will send his Writ to the Justices of *Affize*, by it commanding them to admit them that are so sent.

ASSODES *Febris*, is a kind of burning Fever, in which the sick Person incessantly tumbles and tosses, being exceeding restless, and subject to Sicknefs at the Stomach, and Vomiting, by reason that the Distemper usually arises from the Vexation of the Stomach, by sharp and cholerick Humours, biting the Orifice or Coat thereof. *Blanch*.

ASSOYLE, (a Law Term) signifies to deliver or discharge a Man of an Excommunication,

ASSUMPSIT (in Law) or *Nude Contract*, is a voluntary Promise made by Word, by which a Man assumes and takes upon him to perform, or pay any thing to another : Or a Promise may arise in Law, as upon the sale of Goods, &c.

ASSUMPTION, in Logick, is the *Minor* or *Second Proposition* in a *Categorical Syllogism*.

ASTERICK, is a small Star set over any Word or Sentence, to make it the more conspicuous or taken notice of by the Reader.

ASTERISM, the same with *Constellation*; or a Collection of many Stars into one Class or System, which is usually on the Globe represented by some one particular Image or Figure, to distinguish the Stars that compose this Constellation from those of others.

ASTHMA, or *Phthisick*, is a difficulty of breathing, proceeding from the ill affection of the Substance of the Lungs, and the intercostal Muscles serving to Respiration.

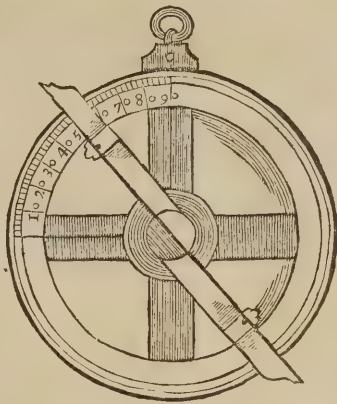
ASTRAGAL, in Architecture, is by the French called the *Talon*, by the Italians *Tondino*, and is a kind of half *Tore*, sometimes wrought (in the Richer Orders) like a kind of overcast Hem or Edge to the larger *Tore*; which frequently is placed between, as in the *Ionick Base*, with two *Scotia's* or *Trochiles*; and sometimes, but rarely, just about the Plinth of the Base. Sometimes it is taken for the Collar or Cinchure next the *Hypotrachelium* and Diminution of a Pillar lifted on both Edges; and it runs also round under the *Echinus* of the *Ionick*. We find it also sometimes dividing the *Fascia* of the Corinthian Architrave, where it is wrought in Chaplets, and Beads or Berries; and sometimes 'tis used both above and below the *Lists*, and joining immediately to the Square or

Die of a Pedestal, where the *Stylobata* is introduced. Freart's *Parallol of Architecture*.

ASTRAGAL, in Gunnery, is the Cornice Ring of a Piece of Ordinance.

ASTROLABE, is a Mathematical Instrument serving to take the Height of the Sun or Stars. It consists of an entire Circle, whose Limb (or what Part of it is necessary) is divided into Degrees and Decimal Parts of a Degree, with a moveable Ruler or Label which turns upon the Centre, and carries two Sights. At the Zenith is a Ring to hang it by in time of Observation, and then you need only turn it so to the Sun, that the Rays may pass freely through both the Sights, and the Edge of the Label cuts the Altitude in the Limb. This *Astrolabe*, though now not much in use at Sea, yet if well made, graduated and poised, and of a great Thickness and Weight, that it may hang the steadier, it may be a very serviceable Instrument, especially between the Tropicks, where the Sun comes near the Zenith; and in calm Weather. There are also some Projections of the Sphere which are called by this Name, as that of *Gemma Erizius* and *Stoffler*.

The Common Sea Astrolabe.



ASTROLOGY, is an Art which pretends to foretel future things from the Motion of the Heavenly Bodies, and their Aspects to one another; and also from some Imaginary Qualities, which the foolish Admirers of this Cheat will have to be in the Stars, as the Causes of great Sublunary Effects; though they have no tolerable Grounds to prove that there are any such things. And therefore as I wish that such a ridiculous Piece of Foolery as this may be quite forgotten, so I have every where omitted explaining any of its Terms, unless they fall in with *Astronomy*.

ASTRONOMICAL Calendar, is an Instrument engraved on Copper Plates, printed on Paper, and pasted on Board, with a Brass Slider, which carries a Hair, and shews, by Inspection, the Sun's Meridian, Altitude, Right Ascension, Amplitude, Declination, Time of its Rising and Setting, &c. to greater nicety than the largest Globes now made.

ASTRONOMICAL Numbers : See *Sexagesimal Fractions*.

ASTRONOMICAL Place of a Star or Planer, is its Longitude or Place in the *Ecliptick*, reckoned

ed from the beginning of *Aries*, in *Consequencia*, or according to the natural order of the Signs.

ASTRONOMICAL Quadrant, is an Instrument curiously framed, and the Degrees exactly and minutely divided by the help of a Screw on the Edge of the Limb, fitted with Telescopes, and either apply'd to a Wall in the Meridian; or on a strong Axis or Pedestal, with two Semi-circles placed at Right Angles on two endless Screws, which readily direct or guide the Instrument to take Observations of the Sun, Moon or Stars.

ASTRONOMY, is a Mathematical Science, teaching the Knowledge of the Stars or Heavenly Bodies, and their Magnitudes, Distances, Eclipses; Order, and Motions: By some 'tis taken in so large a Sense, as to contain in it also, the Doctrine of the Mundane System, the Laws of the Planetary Motions, &c. which others reckon as a part of Physicks or Natural Philosophy.

ASYMMETRY, the same with *Incommensurability*, which see.

ASYMMETRICAL, the same with *Incommensurable*.

ASYMPTOTES, are Lines which continually approach nearer to each other, but tho' continued Infinitely, can never meet. Of these there are many kinds, as the Curve of the *Concoid*, &c. but it may be enough here to mention the Famous.

ASYMPTOTES in *Conick Sections*, which are the Lines *OS* and *OR*; and are thus drawn; Imagine, in the *Hyperbola*, the *Second* or *Conjugate Axis PQ* to descend still keeping parallel to the *Ordinates*, till it touch the *Vertex* of the Section *E*, for then, if thro' the Centre *O*, you draw Lines thro' the Ends of this Tangent Line *p q*. These are the Famous *Asymptotes* mentioned by *Apollonius*, Lib. 2. Prop. 1.

and of which he demonstrates, that tho' infinitely produced, and tho' the Curve come continually nearer and nearer to them, yet can they never be Co-incident with the Sides of the *Hyperbola*, nor ever meet it, or touch it; whence comes their Name of *Asymptotes*: And by some Latin Writers they are called *Intactæ*, for the same reason. This Non-Co-incidence appears very plainly; where the Section of the *Hyperbola* is made parallel to the Triangular Section of a Cone by the Ax; As,

Suppose along the Line *ef* parallel to *EF*. For if you imagine the *Hyperbola g e b* to be moved forward parallel to it self, as far as the length of the equal and parallel Lines,

g G, f F, E e, H h, till it come to be in the position *GEH*, or to be co-incident with the Triangular Section by the Ax, then it will be manifest, that the Hyperbolic Line *GEH* is distant each way from the Asymptotes *BC, BA*, by the length of the versed Sines of the equal Arks

b C and *g A* in the Circumference of the Circular Base of the Cone; and that at the same time it comes, if produced, still nearer and nearer to them. And consequently, I say,

1. *RG* and *HS*, or *AG* and *HC* being always equal to one another; as are also the Ordinates *GF* and *FH*, &c. The Rectangles *RG S* and *SHR*, *AG C* and *CHG*, will always be respectively equal to one another.

2. The Curve and the *Asymptote* can never meet, because the Circles generated by *EQ*, and the Rings generated by *RS*, and *HC*, &c. (which will arise from the Imaginary Revolution of the whole Figure round the Axis *FE*) will always be equal to one another, and to the Circle made by the Revolution of the Radius *E q*, as is plain by comparing this last Figure with the former in N°. 1, 2.

For the Spaces generated by the Lines *E q, FC*, &c. will be as the Squares of their Diameters, or of the Generating Lines. But 'tis certain, that the Square of *Fb* or of *FC*, exceeds the Square of *Fh*, by the Square of *bH* or *f F*; that is, by the Square of *EQ*, by the Supposition above; wherefore the Circle generated by the Motion of *FC*, will exceed that generated by *FH*, by that Circle generated by *EQ*. But the Space generated by *FC*, exceeds that generated by *FH*, by the Ring generated by *HC*; wherefore that Ring made by *HC*, must be equal to the Circle made by *EQ*, *QED*. And this will always be so; and therefore the Line *HC*, can never grow of no length, and consequently the Curve and the *Asymptote* can never meet.

There are other *Asymptotes* to other Curves; and tho' the *Parabola* hath no *Asymptote*, yet two *Parabolas* may be drawn *Asymptotically* to each other.

The following general Observations about *Asymptotes* and *Asymptotick Curves*, I had communicated from Mr. Humphrey Ditton, now Master of the New Mathematical School in *Christ's Hospital*, a Person peculiarly skilful in these Matters, and are as follows.

Some General Observations about Asymptotes, and Asymptotical Curves.

I. Tho' it be certain that all such Curves as have *Asymptotes*, be of the Number of those which (running on in *Infinitum*) do not include a Space; yet is not true, on the other hand, that wherever we have a Curve of that Nature and Property, we find an *Asymptote* also. For this infinite Continuation of the Curve, is visible in all those of the *Parabolic* Family, and yet none of all these can have an *Asymptote*; that is, not any Right Line placed in any Position to the Curve; which can infinitely approach to it, and yet not cut it, as is not hard to be demonstrated.

II. Of those Curves that have an *Asymptote*, some there are that have two, others that have only one. Instances of the former kind are all the sorts of *Hyperbolic* Curves, which from the Principle of their Genesis (as being formed from *Reciprocal Series*) are easily proved to have two *Asymptotes*. And of the latter sort we have the *Concoid*, the *Cissoid*, and the *Logarithmic Curve*.

the Nature of which considered, as clearly shews that they have one and no more.

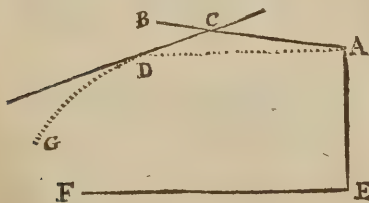
III. As a Right Line and a Curve may be *Asymptotical* to one another, so also may Curves and Curves: And here are two or three Varieties to be considered.

1. Any of these Curves that have from their own Nature and Construction an *Asymptote*, are capable of being *Asymptotical* to one another. Thus in Conick Sections 'tis demonstrated, that Hyperbola's that have the same common *Asymptote*, are also themselves *Asymptotes* to each other; and this shall afterwards be shewn universally of all such Curves.

2. Not only those Curves which are endowed with an *Asymptote*, but even such as in their own Nature admit of no such thing, may also have this Affection. The Parabola (for instance) we know has no *Rectilineal Asymptote* belonging to it; and yet two Parabola's, with their Axes placed in the same Right Line, will be *Asymptotical* to each other; as *De la Hire* has demonstrated, *Señ. Conic. Lib. 6.*

3. But no Curve that has any *Asymptote* belonging to it, can ever be *Asymptotical* to another whose Nature refuses a *Rectilineal Asymptote*; for if it were supposed to be so, then this latter Curve would have the *Asymptote* of the former Curve for its own *Asymptote* too, which is contrary to the Hypothesis of its having none at all. Thus, for Instance, a Parabola and an Hyperbola can never be *Asymptotical* to one another; for were it so, the *Asymptote* of the Hyperbola would be also an *Asymptote* to the Parabola; which is impossible, since that Curve can have no *Asymptote*.

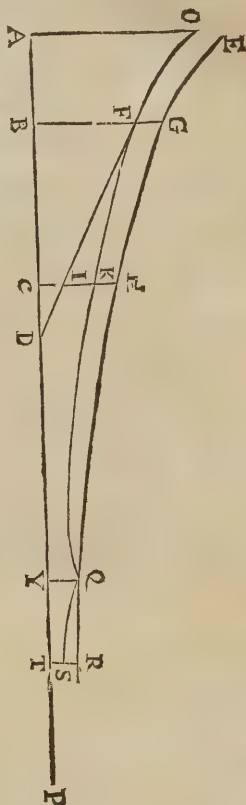
IV. No Right Line can ever possibly be an *Asymptote* to a Curve that is every where concave towards that Right Line: This is very clear from the bare Consideration of the Curvature, and the Tendency of it; and may be thus brought into Demonstration.



Let the Curve *ADG* (whose Ax is *AE*) be concave in all its Parts towards the Right Line *FE*; this Line then *FE*, shall never be an *Asymptote* to the Curve *ADG*. Let *AB* touch the Curve in the Vertex *A*, and be imagined parallel to *FE*; then any other Tangent as *CD*, suppose shall, if it be produced, meet with *FE* in some Point or other; but because *CD* is a Tangent, therefore the Curve Line it self falls between the Tangent and the Line *FE*; but it is by the Hypothesis also concave to all its Parts; therefore if the Tangent *CD* produced, intersects *FE*, *a fortiori*, the Curve *CDG* shall meet with it also; and therefore *FE* is not an *Asymptote*.

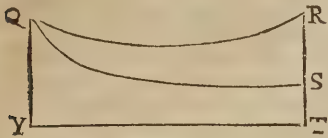
V. But a Right Line may be an *Asymptote* to a mixt Curve that is partly Concave and partly Convex towards the same Line. An Instance of this we have in the *Conchoid of Nicomedes*, which is Concave (for some Parts of it) to its Normal, and then after the *Punctum Flexus*, in which 'tis neither Concave nor Convex, it is for ever Convex towards the same. Concerning which *Punctum Flexus*, see *Schoten. Comment upon Cart. Geometry, Lib. 2.*

VI. All Curves that have one and the same Common *Asymptote*, are also *Asymptotical* to one another.



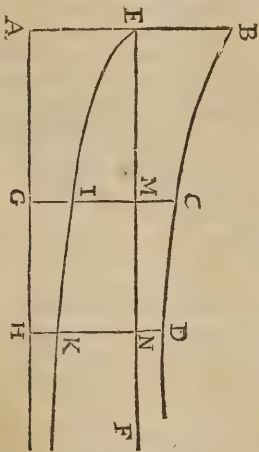
Let the Curves *EGH*, *OFK*, have the common *Asymptote ADP*; then they shall be *Asymptotical* to each other. First of all it is evident, that they continually approach to one another; for instance, drawing the Line *FD* a Tangent to the Curve *OK* in *F*, to meet with the *Asymptote* in *D*, and producing *BF* to *G* in the Curve *EH*, draw *GH* a Subtense in that Curve parallel to *FD*; and then from *H*, the Line *HKC* parallel to *GB*, 'tis clear, that *FG=HI*, and *HI ⊥ HK*, because *FD* touches in *F*; therefore *FG ⊥ HK*, that is, the Curves are nearer to one another in the Points *H, K*, than in *F, G*; and the same may be shewn of any other Points taken from the Parts of *B, C*, towards *P*. But then again, these Curves can never possibly meet with, or cut one another. For imagine they could, and did intersect each other, at the Point *Q* suppose; and let *QY, RT* be parallel to *BG, HC*. The Curve *OKF* goes above

above the Curve *EGH* (after the Intersection in *Q*) into *R* suppose, and the other falls below, as suppose at *S*. Now if two Curves as *QR*, *QS*,



cut in *Q* the Curve *QR* departing from *QS*, 'tis plain that some Point, as *R*, may be taken in the Curve *QR*, from whence a Right Line, as *RT*, drawn to another Line, as *YT*, shall be equal to *QY*, the Line from *Q*, the common Section of the Curves to the same Line *YT*. This follows from the Nature of Curve Lines in general. Now let us suppose these Curves that cut thus to have the Line *YT* for their common *Asymptote*; then from the general Nature of Curves, we can find the Point *R*, from whence *RT* shall be $= QY$, but upon the Hypothesis that *YT* is an *Asymptote*, 'tis impossible that *RT* should be $= QY$, for the Lines intercepted between the Curve and its *Asymptote*, are still less and less, and therefore *RT* must be less than *QY*, because of the *Asymptote*; and from hence 'tis certain, that two Curves, which have one and the same *Asymptote*, can never cut each other.

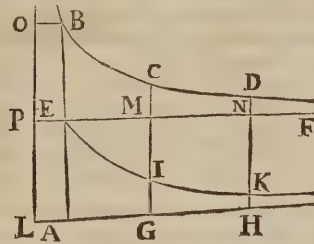
VII. Two equal Curves of the same sort, whose *Asymptotes* are parallel, with themselves be equidistant in all their Points. These Curves are supposed to be such as have but one *Asymptote* a piece.



Let *EF* be the *Asymptote* of the Curve *BCD*, and *AH* the *Asymptote* of the Curve *EIK*; and the Curves being by the Hypoth. of the same kind and equal, therefore $EB = EA$, and $IG = CM$, and $DN = KH$, and $IG + IM = CM + IM$, and so $DN + NK = KH + NK$; but $KH + NK = IG + IM$ (for *EH* is a Parallelogram) therefore $CM + IM = DN + NK$, that is, $CI = DK$; and so in all other Points from whence the Curves are equidistant.

VIII. The same thing is true also of equal Curves of the same sort that have two *Asymptotes* each, but with a Limitation. Suppose *LO* to be one

common *Asymptote* to both Curves, and *PN* the other for the Curve *BCD*, as *LH* is for the Curve *EIK*; where the lower Curve cuts the



Asymptote of the upper in *E*, drawing *BEA* parallel to *OL*; 'tis evident that from the Points *B* and *E* to the Parts of *D* and *K* infinitely, the Curves are equidistant from one another: For by the Hypothesis, the Points *P* and *L* are the Concourses of the *Asymptotes*, and $PE = LA$, BE, CM, DN , are ever $= EA, IG, KH$, &c. from whence the Conclusion follows as before.

ASYNDETON, is a Figure in Grammar, implying a Defect or want of Conjunctions in a Sentence (as *Polyasyndeton* is a Redundancy of them) as in this Instance, *Græculus Esuriens, in Cælum iusseris, ibit*; where the *Si* before *Iusseris* is omitted.

ATCIEVEMENT, in Heraldry, signifies the Coat of Arms of any Gentleman duly Marshalled with Supporters, Helmet, Wreath and Crest, and with Mantles and Woods, or as the Herald calls it, with *Heaume* and *Timbre*, i.e. with *Helmet* and *Crest*. Such are usually hung out on the Fronts of Houses after the Death of the Lord, Lady, Master, or some considerable Person; and are now corruptly called *Hatchments*.

ATHANOR, a kind of digesting Furnace in Chymistry, fix'd and large, and made with a Tower, which is contrived so as to keep a constant Heat for 14 Days, a Month, &c. or the Heat may be increased or diminished at pleasure, by opening or shutting the *Registers*.

ATHEROMA, a sort of Tumour or Swelling consisting of a thick and tough Humour like Pap, contained in a Bag or Membranous Coat. It neither causes Pain, nor changes the Colour of the Skin. It doth not easily yield to the Touch, nor leaves any dint after it is compressed.

ATHYMIA, is a Dejection or Anxiety of Mind.

ATLAS, in Anatomy, is the first *Vertebra* of the Neck under the Head; so called, because it seems to hold up the Head: it wants Marrow.

ATMOSPHERE, is the lower part of the Region of the Air or Ether, with which our Earth is encompassed all round; and up into which the Vapours are carried, either by Reflection from the Sun's Heat, or by being forced up by the Subterranean Fire.

The Pressure of the *Atmosphere*, Mr. Boyle undertakes to demonstrate from many Experiments, as,

1. That two polished Marbles of about th *Sul* Inches Diameter, and which would in the 1 being Air sustain a Weight of 80 *lb*. before they it in the fall asunder, would, in the exhausted *Ed*, and by fall asunder with a Pound, and sometimes in it, half a Pound Weight. Nay, thoughnd other such

Receiver was evacuated, the upper Marble being let down to touch the other, it would by no means adhere to it; yet when this was tried after the Re-admission of the Air into the Receiver, the Marbles then, on their being brought to touch each other, would as strongly adhere as at the first. *History of Experiments*, P. 288.

The Height of the *Atmosphere* is variously conjectured: *Kepler* makes it about eight Miles; but other eminent and later Astronomers, especially the Learned and Diligent *Ricciolus* makes it probable, that the *Atmosphere* may be at least fifty Miles high.

Mr. Boyle makes the common Height of the *Atmosphere*, when the Mercury in the *Baroscope* is at 30 Inches, to be 35000 Foot, or seven Miles; but this Account is upon a Supposition, that all our Air is of the same Density and Weight from the Surface of the Earth to the Top of the *Atmosphere*; which can by no Means be supposed, and therefore he rightly concludes it must be much more. Nay, in his Book against *Linus* he suggests, that 'tis probable it may be some *Hundreds*, and even *Thousands* of Miles high, in case the *Atmosphere* be not a bounded Portion of the Air, but reach as high as it.

The same Honourable Philosopher got a hollow Cylinder of Brads to be exactly turned by a good Artift, whose Length was 3 Inches; and the Diameter of its Bore just an Inch: This had a Bottom nicely fitted to it; and then being filled with Quickfilver (the Weight of the Cylinder being before known) it held as much as weighed 17 Oz. 1 Drachm, 45 gr. Troy. This being multiplied by 10 (because the Barascope then shewed the Mercury to be at 30 gr.) gave 14 lb. 2 oz., and above 3 drachms Troy, for the Weight of a Column of Mercury of an Inch in Diameter, and 3 Inches in Length. And so much consequently was the Weight of a Column of Air of an Inch in Diameter, and of the whole Height of the *Atmosphere*.

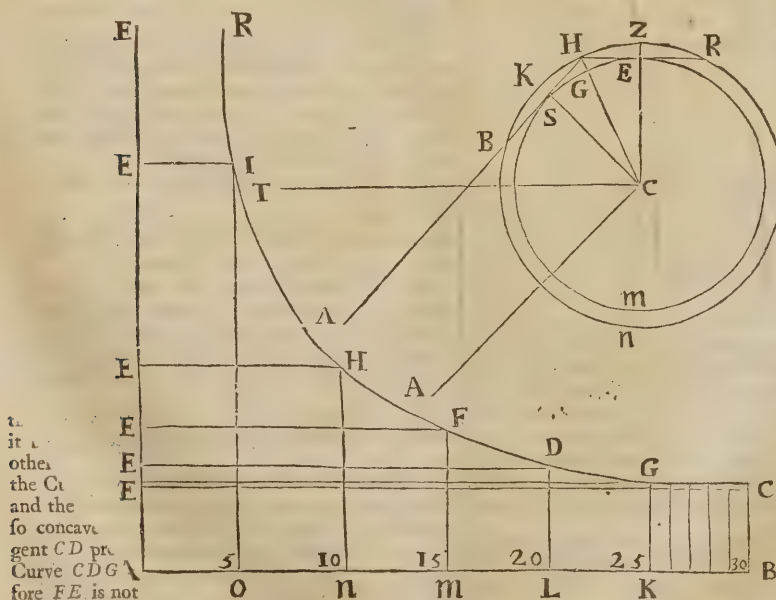
Hence, knowing the Proportions of Cylinders,

(which see under Cylinder) 'tis easy to calculate the Weight of a Cylinder of Mercury, and consequently of Air to the Top of the *Atmosphere*, of any given Diameter. For as 1. the Square of the Diameter of the Cylinder above-mentioned, is to the Square of the given Diameter of the Cylinder sought (which, if it were two Inches Diameter, will have its Square 4) :: So is the Weight of the Cylinder above-mention'd, to the Weight of that sought. Work as in the Rule of Three, and you have your Desire.

In Mr. Boyle's Description of his Statical Baro-
scope, he tells us, That he found a Pillar of Air in-
cumbent on a square Inch, to weigh 18 lb. $\frac{1}{2}$ Troy.
From which Account I calculated the Weight
of the whole Air, all round the Globe, to be
8,990425732208000000 Pounds Troy, which a-
grees nearly with the Weight of it calculated by
Mr. Pascal (tho' he proceeded a very different way)
for he makes it to be 8,283889440000000000.

Mr. Halley by undoubted Experiments, found that the Weight of Mercury to Water, is as $13\frac{1}{2}$ to 1, or very near it; and that the Specific Gravity of Air to Water, is as 1 to 800; so that the Weight of Mercury to Air, is as 10800 to 1; and a Cylinder of Air of 10800 Inches or 900 Feet, is equal to an Inch of Mercury; so that were the Air of an equal Density like Water, the whole Atmosphere would be no more than $5\frac{1}{2}$ Miles high; and in the Ascent of every 900 Feet, the Barometer would sink an Inch. But the Expansion of the Air encreasing in the same Proportion as the incumbent Weight of the Atmosphere decreases, that is, as the Mercury in the Barometer sinks, the upper Parts of the Air are much more rarified than the lower, and each Space answering to an Inch of Quick-silver, grows greater and greater; so that the Atmosphere, must be extended to a much greater Height.

To determine the Height of the Mercury at any assigned Height of the Air; or having that given, to find the Height of the Place where the Barometer stands.



Since the Expansion of the *Air* is Reciprocally as the Height of the *Mercury*, it is evident, that by the help of the Curve of the *Hyperbola* and its *Asymptote*, the said Expansions may be expounded to any given Height of the *Mercury*.

For by the 65th Prop. Lib. 2. Conic. *Mydorgii*, the Rectangles *ABCE*, *AKGE*, *ALDE*, &c. are always equal; and consequently the Sides *CB*, *GK*, *LD*, &c. are reciprocally, as the Sides *AB*, *AK*, *AL*, &c. If then the Lines *AB*, *AK*, *AL*, be supposed equal to the Heights of the *Mercury*, or the Pressures of the *Atmosphere*, the Lines *CB*, *GK*, *LD* answering thereto, will be as the Expansions of the *Air* under those Pressures, or the Bulks that the same quantity of *Air* will occupy; which Expansions being taken infinitely many, and infinitely little (according to the Method of Indivisibles) their Sum will give the Spaces of *Air*, between the several Heights of the *Barometer*; viz. the Sum of all the Lines between *CB* and *GK*, or the Area *CBKG* will be proportioned to the Distance or Space intercepted between the Levels of two Places in the *Air* where the *Mercury* would stand at the Heights represented by the Lines *AB*, *AK*; so then the Spaces of *Air* answering to equal Parts of *Mercury* in the *Barometer*, are as the Areas *CBKG*, *GKLD*, *DLFM*, &c. But these Areas are proportionate to the Logarithms of the Numbers expressing the Ratios of *AK* to *AB*, of *AL* to *AK*, of *AM* to *AL*, &c. as was demonstrated by *Gregory St. Vincent*; so then, by the common Table of Logarithms, the Height of any Place of the *Atmosphere*, having any assigned Height of *Mercury*, may most easily be found; for the Line *CB* in the *Hyperbola*, whereof the Area's design the Tabular Logarithms, being 0,0144765; 'twill be as 0,0144765, to the difference of the Logarithm of 30, or any other lesser Number, so 900 Feet, or the Space answering to an Inch of *Mercury*, if the *Air* were equally prest with 30 Inches of *Mercury*, and every where alike to the Height of the *Barometer* in the *Air*, where it will stand at the lesser Number of Inches: And by the Converse of this Proportion may the Height of the *Mercury* be found, having the Altitude of the Place given.

Upon these Suppositions 'twill appear, that at the Height of 41 Miles the *Air* is so rarified, as to take up 3000 times the Space it occupies here, and at 53 Miles high, it would be expanded above 300000 times; but 'tis probable that the utmost Power of its Spring cannot exert it self to so great an Extension, and that no part of the *Atmosphere* reaches above 45 Miles from the Surface of the Earth.

This is further confirmed from the Observations of the *Crepusculum*, which is observed commonly to begin and end when the *Sun* is 18 Degrees below the *Horizon*; for supposing the *Air* to reflect Light from its most rarified Parts, and that as long as the *Sun* illuminates any of its *Atoms*, they are visible to an Eye not intercepted by the Curvature of the Earth; it will follow that the Proportion of the Height of the whole *Air*, to the Semi-diameter of the Earth, is much about, as 1 to 90, or as the Excess of the Secant of about 8½ Degrees to the Radius. For if *E* be the Eye of the Observer, *S* a Place where the *Sun* sets at the end of Twilight in *E*, and the Ark *ECS*, or *TCA*, be found 18 Degrees, the Excess of the Secant of half thereof *ECH*, would be the Height of the

Air, viz. *GH*. But the Beam of the *Sun* *ASH*, and the visual Ray *EH*, do each of them suffer a Refraction of about 32 or 33 Minutes, whereby being bent inwards from *H* towards *G*, the Height of the *Air* need not be so great as if they went strait; and having from the Angle *ECS* taken the double Refraction of the Horizontal Ray, the half of the Remainder will be 8½ Deg. *secriter* whose Secant being 10111, it follows, that as 10000 to 111, so is the Semi-diameter of the Earth, supposed 4000 Miles, to 44, 4 Miles, which will be the Height of the whole *Air*, if the Places *ES*, whose visible Portion of the *Atmosphere* *ERZH*, and *SHKB* just touch one the other, be 18 Degrees asunder.

At this Height the *Air*, is expanded into above 3000 times the Space it occupies here; and we have seen the Experience of condensing it into the 60th part of the same Space; so that it should seem, that the *Air* is a Substance capable of being compres'd into the 180000th part of that Space it would naturally take up when free from Pressure.

ATMOSPHERE of consistent Bodies: The Honourable Mr. Boyle hath written a small Essay on this Subject, in which he proves, that very many, and therefore probably all solid, firm and consistent Bodies (i. e. such as are not Fluid) have, at some certain times (at least) effluvia of Particles of Matter which exhale from them: For he found, that many such Bodies would in a little time be very sensibly diminished in Weight: That some Electrical Bodies, as Amber and Glass, would exert that Property uniformly all round them when they were heated; which they usually exhibit upon Rubbing or Chafing; viz. That of attracting small Bodies to them: That Glass, Stones and hard Metals, would, on being rubb'd one against another, strongly emit not only sensible, but even offensive Odours, &c.

ATOME, is such a very small Particle of Matter, that it cannot Physically be cut or divided into lesser Parts: *Epicurus* and his Sect of Philosophers, first called the component Principles of all Bodies, which they supposed to be infinitely small and hard, by this Name of *Atoms*. These *Atoms* may be supposed to have these 4 inseparable Properties; 1. That they are all of the same Nature, Substance or Matter; for all Matter abstracted from Form is the same. 2. That they have all some Magnitude or Quantity; for they are not Indivisible Points, but Physical Bodies of some (though small) determinate Bulk. 3. They have also all of them some determinate Figure or Shape. And, 4. They must have also, each of them, some real Gravity or Weight. To these *Sextus Empiricus* adds *ἀνιστορία* or Renitency; but this rather may be supposed to be the Consequence of their being Solid and Inseparable, which they are, as they are *Atoms*.

The Original Qualities of *Atoms* can only be their Size and their Figure, and these taken together make their Form.

ATONY, is a Faintness, Infirmary or Defect of Strength.

ATRA Bilis, is supposed to be a kind of a Sulphureous Terrene and Adust Salt, which being bred in the Body (some will needs have it in the Spleen) is circulated about in the Blood, and by that means makes and undue Fermentation in it, and is the Occasion of Melancholly and other such like Distempers.

ATREUS, is one whose Fundament or Privy Parts are not perforated.

ATROPHY or *Tabes*, a Consumption arising from want of Nourishment, and when either the whole Body, or some particular Limb, withers and decays away. Though *Tabes* is often taken only for an Ulcer in the Lungs, from whence the whole Body by degrees decays and perishes.

ATTACHIAMENTA Bonorum, a Distress taken upon the Goods or Chattels of any one sued for Personal Estate or Debt by the Legal Attachiators or Bayliffs, as a Security to answer the Action.

ATTACHIAMENTA de Spinis & Bosco, is the Privilege granted to the Officers of a Forest to take to their own use Thorns, Brush and Windfall, within such Precincts or Liberties committed to their Charge.

ATTACHMENT, (in Law) is a Taking or Apprehending by Command or Writ: It differs from an *Arrest* in this, that an *Arrest* lies only upon the Body of a Man, whereas an *Attachment* is sometimes on the Goods only, and sometimes on Body and Goods.

ATTACHMENT of Privilege, either gives Power to apprehend a Man in a Place privileged, or by Vertue of an Office or Privilege, to call another into that Court whereunto himself belongeth.

ATTACHMENT Foreign, is a Process which is used to attach the Goods of Foreigners found within the Liberty or City, for a Debt due to the Party himself.

ATTACHMENT of the Forest, is a Court held there every 40 Days throughout the Year.

ATTACK of a Siege, (in the Art of War) is the Effort made by the Besiegers with Trenches, Mines, Galleries and Breaches, in order to make themselves Masters of a Fortrefs in Storming one of its Sides.

ATTACK False, is that which is not vigorously prosecuted, serving only to make a Diversion among the Besieged, and to oblige them to divide their Forces, that the true *Attack* may be carried on with greater Success.

To **ATTACK in Flank**, is to attack both Sides of the Bastion.

To gain a Place by **Right Attack**, is to carry it by formal *Attack* and regular Works, without a general Storm.

ATTAINDURE, is when a Man hath committed Felony or Treason, and Judgment is passed upon him. The Children of a Person attainted of Treason cannot be Heirs to him, or any other Ancestor; and if he were Noble and Gentile before, thereby his Posterity are degraded and made Base; and this Corruption of Blood cannot be salved but by an Act of Parliament, or unless the Judgment be reversed by Writ of Error.

ATTAINT, (in Law) is a Writ that lies where a false Verdict is given by twelve Men, which, if found to be a false Verdict, the twelve Men are *Attaint*, and the Verdict shall be, that their Meadows shall be egged, their Houses broken down, their Woods turned up, and their Lands and Tenements forfeited to the King. But if it pass against him that brought that *Attaint*, he shall be imprisoned, and grievously ransomed at the King's Will.

ATTAQUES: See *Attack*.

ATTENTION, is to register in the Memory

those Trains of Idea's which continually offer themselves to the Mind, and are taken notice of.

ATTENUATING Medicines, are those things which opening the Pores with their Acute Particles, cut the thick and viscous Humours in the Body into such small Particles as that they may easily be circulated through the Vessels, and so there is made by degrees an

ATTENUATION, or lessening of the Power or Quantity of the Morbifick Matter.

ATTICK, a kind of Order in Architecture after the Manner of the City of Athens. *Vitruvius* makes it the Name of a *Basis*, which the Modern Architects have since given to the Dorick Pillar. In our Buildings, the *Attick* is a little Order placed upon another much greater, having, instead of Pillars, nothing but *Pilasters* of a particular Form or Fashion.

ATTIRE, the Heralds call the Horns of a Stag or Buck his *Attire*.

ATTIRE, in Botany, signifies, according to Dr. *Grew*, the third part belonging to the Flower of a Plant; of which the two former are the *Empalement* and the *Foliation*. This *Attire* he finds to be of two kinds, *Semini-form* and *Florid*; the *Semini-form Attire* consists of two Parts, *Chieues* (or the *Stamina*, as some call them) and *Semets* or *Apices*, one upon each *Attire*. The *Florid Attire* is usually called *Thrams*, as in the Flowers of Marigold, Tansy, &c. These *Thrams* the Dr. calls *Stems*, which consist of two, but most times of three Pieces; the outer Part of the *Suit* is the *Flower*, whose Body is divided at the Top like a *Cowslip* Flower into 5 Parts or distinct Leaves.

ATTOLLENS Auriculam, is a Muscle which consists of divers fleshy Fibres, and is annexed to that Part of the *Pericranium* that covers the Temporal Muscle, whence it descends directly to its Implantation at the Superiour Part of the second Wrinkle of the Cartilage of the Ear. Its Name shews its Use.

ATTOLENS Oculos, or *Superbus*, one of the six Pairs of Muscles that belong to the Eye, serving to lift them upwards.

ATTOLENS Nares, a Muscle of the Nose, whose Name shews its Use.

ATTOLLENTES, are a Pair of Muscles which acting both together, draw all the upper Lip directly upward and outward; but if only one, then one Side of the Lip is drawn obliquely.

ATTONITUS, *Stupor*, seu *Morbus Attonitus*: See *Apoplexy*.

ATTORNATO faciendo vel recipiendo, is a Writ which a Man owing Suit to a County, Hundred, Wapentake, or other Court, and desiring to make an *Attorney* to appear for him, whom he doubteth whether the Sheriff or Bayliff will admit or not, purchaseth to command him to receive and admit him.

ATTOURNMENT, (in Law) is when one is Tenant for term of Life, and he in Reversion or Remainder grants his Right or Estate to another, then it behoves the Tenant for Life to agree thereto; and this Agreement is called an *Attournment*.

ATTRACTING, or *Drawing Medicines* or Things, are those which opening the Pores with their little Particles, and dilating the Humours and expelling them, where their Resistance is smaller, not only shews the Parts, and makes them Red,

Red, but by driving more Vapours and Humours out of the Skin and Fleſh, than can make their way thro' the thick inner Skin, gather them under it, and ſwell it into little Bladders.

ATTRACTION, is the drawing of one thing to another. Whether among the Operations of Natural Bodies one upon another, there be any ſuch thing as *Attraction*, properly ſo ſpeaking, is a Queſtion that hath been much debated amongſt Philoſophers: And perhaps moſt of thoſe Effects which the Ancients, not knowing ſo well the Cauſes of, did uſe to attribute to *Attraction*, may now be very well ſolved by *Puſſion*. See *James Bernoulli, de Gravitate Aetheris, Amſterdam 1683, in 8°*. However the Word is retained by good Naturaliſts, and in particular, by the Excellent Sir *Iſaac Newton* in his *Principia*; but without there determining any thing of the *Quality* of it, for he doth not conſider things ſo much Phyſically, as Mathematically. This therefore being pre-miſed, he lays it down as an Axiom; That ſince *Action* and *Re-action* are always equal and directly contrary to each other; therefore if any thing Attract another, it is it ſelf alſo as much attracted by that other thing; taking *Attraction* in the largeſt and moſt general Senſe, for the *Conatus* of one Body towards another, however it be cauſed. And in *Cor. 1. Prop. 58.* he ſhews,

1. That if two Bodies mutually do attract each other (by which he means the ſame as *gravitate* towards one another) by Forces proportionable to their Diſtances, they will deſcribe both about the common Centre of Gravity, and about one another Concentric Ellipſes; and *vice verſa*, if any Body do deſcribe ſuch Figures, their Gravitating or Attracting Forces are proportional to their Diſtances.

2. That if they Attract each other with Forces proportional to the Squares of their Diſtances, they will deſcribe both about the common Centre of Gravity, and alſo about one another, *Conick Sections*, having their *Umbilici* in the Centre about which the Figures are deſcribed; and *vice verſa*, &c.

3. He demonſtrates alſo, That any Particle of Matter within the Superficies of any Sphere or Globe, is attracted or gravitates by a Force proportional to its diſtance from the Centre; but without the Surface of the Sphere, by a Force proportional to the Square of its diſtance from the Centre, *Prop. 73, 74. Lib. 1.*

Hence it will follow, he ſaith,

1. That at equal Diſtances from the Centre of Homogeneous Spheres, The *Attraction* will be as the Sphere.

2. And at any Diſtance whatever, the *Attraction* is as the Sphere divided by the Square of the Diſtance.

3. Which laſt holds alſo in the Attractions of Spheres towards one another; i. e. the Attractions are as the attracting Globes divided by the Squares of the Diſtances, tho' the Globes mutually attract each other.

The Quantity of the Force of Attraction in all Bodies at equal Diſtances, is exactly proportionable to the Quantity of Matter in the Attracting Body, as being in reality nothing but the Reſult or Sum of the united Forces of all thoſe ſingle Particles of which it is compoſed. See *Vol. II.*

ATTRACTIVE, the ſame with *Attracting*.

ATTRIBUTE, is whatever Property belongs properly to any Subſtance or Being, and is affirmed of it, or duly attributed to it, or predicated of it, as the Logicians ſpeak.

ATTRITION, in Phyſick, is the Rubbing of one thing againſt another; as when Amber and other Electric Bodies are rubb'd, to make them attract or emit their Electric Force.

ATTRITION, in Theology, is a Sorrow for offending God, ariſing from the Apprehenſion of being obnoxious to Punishment and Miſery on the Account of ſuch Offence.

ATTURNEY, or Attorney, in a Legal Acceptation, ſignifies one appointed by another Man to do any thing in his ſtead, and is as much as *Procurator* or *Syndicus* in the Civil Law; or *Attorneys* are ſuch Perſons, as are by the Conſent, Commandment or Requeſt of another, to take heed, ſee to, and to take upon them, the Charge of another Man's Buſineſs in his abſence.

AVANT Foſſe, or Ditch of the Counterſcarp, in Fortification, is a Moat or Ditch full of Water running round the Counterſcarp on the outſide next the Campaign at the Foot of the *Glacis*. It is not eligible to have ſuch a Water-Ditch where it can be drained dry; becauſe it is a Trench ready made for the Beſiegers to defend themſelves againſt the Sallies of the Beſieged. Beſides, it hinders putting Succours into the Place, or at leaſt makes it more difficult ſo to do.

AVAST, a Word uſed very commonly aboard a Ship, ſignifying to ſtop, hold or ſtay.

AUDIENCE Court, is a Court belonging to the Archbiſhop of Canterbury, of equal Authority with the *Archies Court*, tho' inferior both in Dignity and Antiquity.

AUDIENDO or Terminando, is a Writ, but more properly a Commiſſion, directed to certain Perſons, when any Riotous Aſſembly, Inſurrection, or heinous Miſdemeanour, or Treſpaſs is committed againſt any Place.

AUDITA Querela, is a Writ that lies where one is bound in a Statute or Recogniſance, or where Judgment is given againſt him for a Debt, and his Body in Execution thereupon; for if he have a Releaſe, or any other ſufficient Diſcharge, but has no Day in Court to plead it, then he ſhall have this Writ againſt him which hath recovered, or againſt his Executors.

AUDITORY Nerve is the ſeventh Pair of Nerves that comes from the *Medulla Oblongata*, ariſing from the hinder part of the *Proceſſus Annularis*; it enters the Hole in the inner Proceſs of the *Os Petroſum*. It is divided into two Branches; that which is ſoft is called *Portio Mollis*, and it is diſtributed into the Labyrinth, *Cochlea*, and the Membranes which cover the Cavities of the Ear. That which is hard, is called *Portio Dura*; it goes out of the Ear by the Hole which is between the *Proceſſus Maſtoideus* and *Styloides*; it is divided into two Branches, of which one goes to the Muſcles of the Tongue, or *Os Hyoides*, and it gives a ſmall Branch to the eighth Pair; the other is diſtributed in the External Ear, Noſe, Lips and Cheeks.

AUDITOR, according to our Law, is an Officer of the King or ſome other great Perſon, which yearly, by examining the Accounts of all under Officers accountable, makes up a general Book; with the Difference between their Receipts and Charge, and their Allowances, commonly called *Allocations*; as namely, the Auditors of the Exchequer

quer take the Accounts of those Receivers, who collect the Revenues of the Aumentation, as also of the Sheriffs, Escheators, Collectors and Customers, and set them down, and perfect them.

AUDITORS of the *Prest* or *Imprest*, are Officers in the *Exchequer*, who take and make up the great Accounts of Ireland, Berwick, the Mint, and of any Money *imprest* to any Man for the King's Service.

AUDITOR of the *Receipts*, is an Officer of the *Exchequer* that files the Teller's Bills, and makes an Entry of them, and gives the Lord Treasurer a Certificate of the Money received the Week before. He maketh *Debentures* to every Teller, before they pay any Money, and taketh their Accounts: He keepeth the *Black Book of Receipts*, and the *Treasurer's Key* of the *Treasury*, and seeth every Teller's Money lock'd up in the New Treasury.

AVE, see *Aile*.

AVELANE, the Form of a Cross which the Heralds give us, which resembles four Filberds in their Husks or Cases, joined together at the great End; from whence it seems to take its Name, for a Filberd is *Nux Avellana*.

ADVENTURE, (but more properly) *Adventure*, is a Term in Law signifying a Mischance, causing the Death of a Man without Felony, as when he is suddenly drowned or burnt, falling into the Water or Fire, or killed by any Disease or Mischance.

AVENUE, (in Fortification) is an opening or inlet into any Fort, Bastion, or such like Place.

AVERAGE, (in Law) is that Service which the Tenant owes to his Lord, to be done by the Beasts of the Tenant.

It also signifies a certain Contribution which Merchants and others pay proportionably towards their Losses that have their Goods cast away in a Tempest, for the saving of the Ship or Goods, or the Lives of them that are therein.

AVERIIS *captis in Withernam*, is a Writ for the taking of Cattel to his use, that hath his Cattel unlawfully taken by another, and driven out of the County where they are taken, that they cannot be replevy'd.

AVERMERT, (in Law) is where a Man pleads a Plea in Abatement of the Writ, or Barr of Action, which he says he is ready to prove, as the Court will award. This offer to prove the Plea is called an *Averment*.

AVERPENY, is to be quit of divers Sums of Money for the King's Arrearages.

AVERRUNCATION, in Agriculture, signifies the lopping off superfluous Branches.

AUGE, an Astronomical Term, the same as *Apogæum*, is that Point of the Orbit, wherein a Planet being, is furthest distant from the Central Body about which it revolves, and is then slowest in Motion, inasmuch that from this Point the distance of a Planet is reckoned, to find thereby the Inequality of its Motion.

AUGMENTATION, was the Name of a Court erected by King Henry the Eighth, for the encrease of the Revenues of the Crown, by the Suppression of the Abbies and Religious Houses: This Court was dissolved in Queen Mary's Reign; but the Office of *Augmentation* remains to this Day, wherein there are many Records of great use and importance.

AUMONE, (Tenure in *Aumone*) is a Tenure *per liberam Eleemosynam*, as where Lands are given to some Church, or Religious House, upon Condition that some Service or Prayers shall be offered

at certain times for the good of the Donor's Soul.

AVOWEE, is he to whom the Right of *Advowson* of any Church appertaineth, so that he may present in his own Name; and is called *Advowee*, for a difference from those that sometimes present in another's Name, as a Guardian that presenteth in the Name of his Ward: And also to be distinguished from those which have the Lands whereunto an *Advowson* appertaineth, but only for term of their Lives, of Years, or by Intrusion, or by Disseisin.

AVOWRY (a Law Term) is, when one takes a Distress for Rent or other thing, and the other sues *Replevin*; now he that took the Distress justifying the Act, is said to *Avow* it.

AURICULÆ Cordis, are two *Appendages* to the Heart, seated at its Basis over the Ventricles; they are so called from some Resemblance that they bear to the Ears of a Man's Head. They arise from a long Basis, and end in an obtuse Point, thereby forming an obtuse Triangle. They are of the same Fabrick and use with the Ventricles over which they stand, being Muscles as they are, made up of the same order of Fibres, which are carried into opposite Tendons; whereof that at the Basis of the Heart is common to it and the *Auricula*, and the other runs along their upper part. The Right *Auricle* is larger and softer than the Left. The Superfices of both is smooth when they are full, but wrinkled when empty, and more so in the Left than in the Right One. On being cut open they exhibit many fleshy Columns running from the Upper Tendon to the Lower, and between them there are pretty deep Furrows or long Cavities, but fewer in the Right Auricle than in the Left. They are dilated and contracted in like manner as the Heart is, but at different times; for the *Systole* of the Ventricles is at the same time with the *Diastole* of the Auricles and *vice versa*; so that the Auricles are receiving their Blood from the Veins, while the Ventricles are expelling theirs into the Arteries: But when the Ventricles are relaxed and empty in their *Diastole*, then the Auricles force the Blood into them by their *Systole*. They are nourished by Branches of Arteries springing from the *Coronaria*, which Dr. *Ruysh* (who seems first to have taken notice of this) calls therefore *Arterie Auriculares*, and no doubt but they have Branches also of Veins to attend them. Their Use is to receive the Venal Blood which comes immediately out of the *Vena Cava* and *Pulmonaris*, and to measure it as it were (saith *Gibson*) into the Ventricles; and to expel it thither with the greater Force, the Internal Fibres or Columns of their Cavity arising from their Root where they are joined to the Basis of the Heart, reach directly outwards towards the *Vena Cava* and *Pulmonaris*; and in the *Diastole* of the *Auricula*, grasp the Blood contained in their Cavities like so many Fingers, and squeeze it into the Ventricles, now relaxed in their *Diastole*.

AURIGA, a Constellation consisting of 23 Stars in the Northern Hemisphere.

AURIPIGMENTUM, yellow Arsenick.

AURUM Fulminans, or *Saffron of Gold*, is thus made; put a *Drachm* of thin Plates of Gold into a Matraiss, and then pour on it by little and little (or else there will be so great an Effervescence, that the Matter will boil over the Glass) 3 or 4 *Drachms* of *Aqua Regalis*. Set the Matraiss in warm Sand, and when the Ebullitions are over, the *Mentrum* will have dissolved as much of the Gold

Gold as it can contain. Pour off the Solution, by Inclination, into another Glass, and then pour into the Mixture gradually, some of the Volatile Spirit of *Sal Armoniack*, or Oil of *Tartar per deliquium*, and the Gold will precipitate to the Bottom of the Glass: Let it stand a while till all is fallen down, then pour off the Liquor, and wash the Powder carefully with warm Water till it grows insipid: Then dry it in a Paper by a gentle Fire, taking care it do not fire, which 'tis apt to do with a terrible Noise. If you dissolve a *Drachm* of Gold, there will be 4 *Scruples* of *Aurum Fulminans* well dried. It takes its Name from its fulminating or making a great Noise like Thunder, when 'tis heated over the Fire in a Spoon, for it will go off like a Gun, but without doing any Mischief, its Force being chiefly downward. The Effect seems to come from some Parts of the *Aqua Regalis*, which remain still sticking in the Gold, and these being of a very Spirituous and Volatile Nature, do break out with great Violence when the Powder comes to take Fire.

Those who would know a way to make as great, but yet a much less expensive Noise, may see the Word *Pulvis Fulminans*. If halftis Weight of Sulphur powdered, be mingled with *Aurum Fulminans*, its fulminating Quality will be destroyed.

Though on several Trials designedly made to make Gun-powder take Fire in Mr. Boyle's exhausted Receiver, it could not be effected; yet he found that *Aurum Fulminans* would take Fire there, and go off, both by means of a Burning-Glass, and of a Piece or hot Iron.

AURUM Mosaicum, is made by mixing and subliming Mercury, Tin, Sulphur and *Sal Armoniac* all together.

AURUM Potabile: The Alchymists pretend to be able to separate the Salt and Sulphur of Gold, and then dissolving it in a Liquor, it may be drank, and therefore is called *Aurum Potabile*: But this is a meer Imposture, the *Aurum Potabile* being nothing usually but some rich Cordial Liquor with Pieces of Leaf-Gold in it.

AUSTERE Tact, is such an one as moderately constringes the Mouth and Tongue with some Austerity, as is the Tact of unripe Fruits.

AUSTRAL, the same with *Southern*: Thus,

AUSTRAL Signs, are the six last Signs of the *Zodiack*; so called, because they are on the South Side of the *Equinoctial*.

AUTHENTICKS, the Word *Authentick* signifies of good Authority; and therefore the 3d Volume or Tome of the Civil Law, is called *The Authenticks*, from the Greek Word *αὐθεντικόν*, because it hath its Authority from it self, and proceeding from the Emperor's own Mouth; or else that they are Originals to other Writings which are transcribed out of them. They are a Volume of new Constitutions, set out by *Justinian* the Emperor, after the *Code*, and brought into the Body of the Law, under one Book.

There is not in these that good Order and Method observed, as there is in the *Code*, or in the *Digest*; but as any doubtful Point came to be considered, you have here the Princes Determination of it; and that set down as the Cases occasionally occurred.

The whole Volume is divided into Nine *Collations*, *Constitutions* or *Sessions* (I mean in the Latin Version, for in the Greek there is not this Division into *Collations*) and these are subdivided

into 188 *Novels*, each of which is distributed into several Chapters. They are called *Novels*, because they were *New Laws* in comparison of the *Code* and *Digest*; just as the *Constitutions* of the Emperors which were newly published after the *Basilica* were called the *Novels* of *Leo*, *Nicephorus*, *Michael*, &c.

AUTOGRAPHY, is the peculiar Hand Writing of any particular Person; or the Original of any Treatise or Discourse, in respect of a Copy.

AUTOMATA, are Mechanical or Mathematical Instruments or Engines, that going by a Spring, Weight, &c. seem to move of themselves, as a Watch, a Clock, &c.

AUTOPSY, is Ocular Inspection, or seeing a thing with our own Eyes.

AUX, the same with *Apogon*.

AUXILIARY Verbs, in Grammar, are such as help to form or conjugate others; as *to have* and *to be* in the *English* Tongue, *Estre* and *Avoir* in the *French*, *Italian*, *Spanish*, &c.

AUXILIUM Cuius, a Precept or Order of Court, for the citing or convening of one Party at the Suit of another.

AUXILIUM Petere, in Law, signifies to pray Suit in a Cause; that is, when an inferior Tenant is impleaded, and not capable to defend the Right in his own Name; he prayeth Aid of the Superior Lord to assist and justify his Plea.

AUXILIUM Regis, King's Aid, or Money levy'd for the King's Use, and publick Service.

AUXILIUM Vicecomitum, the Aid or Customary Dues paid to the Sheriff, for the better support of his Office.

AWARD, (a Term in Law) properly signifying the Judgment of one that is neither assigned by Law, or appointed by the Judges for the ending a Matter in Controversie, but is chosen by the Parties themselves that are at variance.

AWN, in Botany, *Arista*, is the Beard growing out of the Husk of Corn or Grass.

AWNING, aboard a Ship, is when a Sail, a Tarpaulin, or the like, is hung over any part of the Ship above the Decks, to keep off the Sun, the Rain, or the Wind. In a Long-Boat, they make an Awning by bringing the Sail over the Yard and Stay, and boring it out with the Boat-Hook.

AX or *Axe*, the same with *Axis*, which see.

AXILLAR Veins, are the two Branches of the ascending Trunk of the *Vena Cava*, called *Rami Subclarii*, which running obliquely under the *Clavicule*, as soon as they are past them, and go up to the Arm-pits, are called *Axillares*: And each of these parts it self into two Veins, the *Cephalica* and *Basilica*.

AXILLARY Artery, is that part of the *Subclavian* Branches of the ascending Trunk of the *Aorta*, that is got out of the *Thorax* and comes into the Arm-pits.

AXIOM, is such a common, plain, self, evident and received Notion, that it cannot be made more plain and evident by Demonstration, because 'tis its self much better known than any thing that can be brought to prove it; as, *That nothing can be where it is not: That a thing cannot be and not be at the same time: That the Whole is greater than a Part: That where there is no Law, there is no Transgression*, &c.

AXIS, is the third *Vertebra* from the Skull.

AXIS of a Cylinder, is that Quiescent Right Line,

Line, about which the Parallelgram is turned, which by its Revolution forms the Cylinder.

AXIS of a Conick Section, is a Line passing through the Middle of the Figure, and perpendicular to the Ordinates.

AXIS of a Figure, is a Streight Line, conceived to proceed from the Vertex to the Base.

AXIS of a Circle or Sphere, is a Streight Line passing through the Center from one Side to another; and is the same with the Diameter.

AXIS of the World, is an imaginary Line conceived to pass through the Center of the Earth from one Pole to another.

AXIS of the Zodiack, is also conceived to pass through the Earth, and to be terminated in the Poles of the Zodiack.

AXIS of Rotation or Circumvolution, is an imaginary Line, about which any plain Figure is conceived to be turned to make a Solid: Thus a Sphere is conceived to be made by the Rotation of a Semi-circle about its Diameter, and a Right Cone by that of a Right angled Triangle about its Perpendicular.

AXIS Secundus, in the Hyperbole and Ellipsis, is the Conjugate Diameter, which see. This is sometimes called the *Axis Rektus*.

AXIS, in Opticks, is the Ray which of all that are sent to the Eye falls perpendicularly on it, and which by consequence, passed through the Center of the Eye.

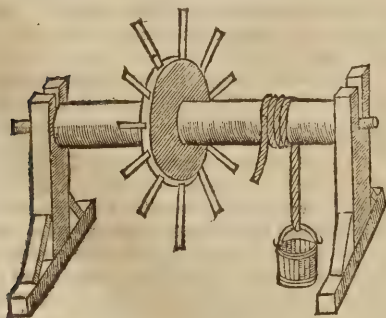
AXIS Common or Mean, is a Right Line drawn from the Point of Concourse of the two Optick Nerves through the Middle of the Right Line which joins the Extremity of the same Optick Nerves.

AXIS of Incidence, in Dioptricks, is a Right Line drawn through the Point of Incidence, and perpendicular to the Refracting Surface.

AXIS of Refraction, is that which is made by the Ray of Incidence, directly prolonged on the Inside of the second Medium by the Ray of Refraction.

AXIS of any Glass (in Opticks) is a Right Line drawn perpendicularly through the Centre of the Glass; or if it be a Convex Glass, through the thickest Part; if a Concave, through the thinnest Part (which in each is called the Pole of the Glass) directly on to the Centre of the Sphere, the Glass Figure is a Segment of.

AXIS in Peritrochio, is a Machine for the raising of Weights, consisting of a Cylindrical Beam (which is the *Axis*) lying Horizontally, and sup-



ported at each End by a Piece of Timber; and somewhere about it, it hath a kind of Tympanum

or Wheel, which is called the *Peritrochium*, in whose Circumference are Holes made to put in Staves (like those of a Windless or Capstain) in order to turn the *Axis* round the more easily, and thereby to raise the Weight required by Means of a Rope which winds round the *Axis*. See Vol. II.

AXIS Indeterminate of an Hyperbola, is a Right Line which divides into two equal Parts, and at Right Angles, an infinite number of Lines drawn parallel to one another within the Hyperbola.

AXIS Determinate, in that Figure, is a Right Line drawn between the Vertexes or Tops of the opposite Sections or Hyperbola.

AXIS Conjugatus, in the Hyperbola: See Conjugate.

AZIMUTH, is an Arch of the Horizon comprehended between the Meridian of the Place, and any other *Azimuth Circle*; or contained between the Prime Vertical, and any other *Azimuth Circle*.

To find the *Azimuth* at any time: See the 11th Case of Oblique angled Spherical Triangles under the Word Trigonometry.

To find the Sun's *Azimuth*, as also the Hour, by the Globe, having the Sun's Place and Altitude given.

Rectify your Globe, and fit the Quadrant; then turn both Globe and Quadrant about till the Sun's Place cut the given Altitude in the Quadrant; for then the Index shews the Hour, and the Quadrant the *Azimuth* in the Horizon.

To find the Sun's *Azimuth* at Six, having the Latitude of the Place, and the Sun's Declination given.

Say, As the Co-Sine of the Latitude: Is to the Radius :: So is the Co-Tangent of the Sun's Declination: To the Tangent of the Sun's *Azimuth* at Six.

Example. Let the Latitude be 51 Deg. 30. Min. and the Sun's Declination be 11°. 30'.

Then to the Ar.co. of the } 51°. 30'. — 0,205850
Co-Sine of
Add the Co-Tangent of 11°. 31'. — 10,690891

Sum is the Tangent of 83°. 50'. — 10,896741
which is the *Azimuth* at Six required.

To find the Time when the Sun will be exactly on the East or West *Azimuth*, having the Sun's Declination and Latitude of the Place given.

Say, As the Co-Tangent of the Declination: Is to the Co-Tangent of the Latitude: : So is Radius: To the Sine of an Ark; which converted into Time, shews the Hour from Six.

Example. Suppose the Declination be 11°. 31'. The Latitude of the Place 51°. 30'.

Then to the Ar.co. of the } 11°. 31'. — 9,309108
Co-Tangent of
Add the Co-Tangent of 51°. 30'. — 9,900605

Sum is the Sine of 09°. 12'. — 19,209713
which is 48 Minutes of an Hour.

Therefore

Therefore the Sun will be due *East* in the Morning 12 Minutes before 7, and *West* in the Evening 12 Minutes after 5.

To find the *Azimuth*, having given the Latitude of the Place, the Sun's Altitude at Six, and present Altitude.

In *Summer*.

Say, As the Co-sine of the Altitude : Is to the Tangent of the Latitude :: So is the Difference between the Sines of the Sun's Altitude at 6, and present Altitude : To the Sine of the *Azimuth* from *East* to *West*.

In *Winter*.

Say, As the Co-sine of the Altitude : Is to the Tangent of the Latitude :: So is the Sum of the Sines of the Sun's Altitude at 6, and present Altitude : To the Sine of the *Azimuth* from *East* or *West*.

AZIMUTH *Compass*, is an Instrument made in a large Box, with Jambols and a broad Limb, having 90 Deg. diagonally divided, with an Index and Thread to take the Sun's Amplitude or *Azimuth*, in order to find the Difference between the *Magnetical Meridian* and the *Sun's Meridian*, which shews the *Variation* of the *Compass*.

AZIMUTH *Magnetical* : See *Magnetical Azimuth*.

AZIMUTHS, or *Vertical Circles*, are great Circles intersecting each other in the *Zenith* and *Nadir*, (as *Meridians* or *Hour-Circles* do in the *Pole*) and cutting the *Horizon* at *Right Angles*.

On the *Globes* these *Circles* are not drawn, but

are represented by the *Quadrant of Altitude* when it is Screwed in the *Zenith*.

And on these *Azimuths* is reckoned the Sun's Altitude, when he is not on the *Meridian*.

AZOTH, among the *Chymists*, signifies sometimes an *Universal Medicine*, sometimes the *Mercury* of a *Metal*.

AZURE, the *Herald's Term* for a *Blue Colour* in the *Coats* of all *Persons* under the *Degree* of a *Baron*; but in the *Escutcheons* of the *Noblemen* 'tis called *Saphir*; and in those of *Sovereign Princes* 'tis called *Jupiter*. In *Engraving* 'tis represented by *Strokes* or *Hatches* drawn only *Horizontal*ly, thus, as in the annexed *Figure*.



AZUGUS or **AZYGOS**, is a notable Branch of the *Vena Cava*, called *Vena sine pari*, because it is single, having no Fellow. It descends thro' the right side of the Cavity of the *Thorax*; and when it is come as far as the *Eighth* or *Ninth Vertebra*, it begins just to keep the *Middle*, and sends forth on each Side *Intercostal Branches* to the *Interstices* of the *Eight* lowest *Ribs*, and there is divided into two Branches, of which the *Larger* descends to the *Left*, betwixt the *Processes* of the *Diaphragm*, and is inserted sometimes into the *Cava* above or below the *Emulgent*, but oftner into the *Emulgent* it self. The other, which goes down on the *Right-hand*, enters the *Cava*, commonly a little above the *Emulgent*, but very seldom is joined to the *Emulgent* it self.

BAC

BACCIFEROUS Plants, whether Trees, Shrubs or Herbs, are such as bear Berries; and Berries are Fruits covered with a thin Membrane, in which is contained a Pulp, which grows soft and moist when ripe, and contains the Seed within the Subtance. The Bacciferous Herbs are the *Chamemorus*, *Smilax aspera*, *Bryonia Alba* and *Nigra*, *Angelica Baccifera*, *Aconitum Racemosum*, *Solanum Racemosum Americanum*, *Hypoglossum*, *Laurus Alexandrina*, *Oxymyrsine*, *Polygonatum*, *Lilium Convallium*, *Monophyllum*, *Mandragora*, *Herba Paris*, *Solanum Lethale*, *Malum Insanum*, *Solanum Vulgare*, *Alfine Baccifera*, *Solanum Somniferum*, *Alkekengi*, *Asparagus*, *Vitis Idæi pallustris*, &c.

The Bacciferous Trees, Mr. Ray divides into four kinds.

1. Such as bear a Caliculate or Naked Berry, the Flower and Calix both falling off together, and leaving the Berry bare; as the *Sassafras* Tree, &c.
2. Such as have a Naked, Monopyrenous Fruit, i. e. containing in it only one Seed; as the *Arbutus Terebinthus*, *Lentiscus*, *Viscus*, *Phyllæa*, *Sambucus Aquaticus*, *Lawreola*, *Chamelea Germanica* (or *Meze-reon*) *Viburnum*, *Cornus*, *Rhamnus*, &c.
3. Such as have also a Naked but Polypyrenous Fruit; i. e. one containing two or more Kernels or Seeds within it; as the *Talaminum*, *Ligustrum*, *Alnus*, *Berberis*, *Alaternus*, *Sambucus Vulgaris*, *Vitis*, the Tea Plant, *Eunonymus Vulgaris*, *Agrifolium*, *Rhamnus Catharticus*, *Capparis*, *Erica Baccifera*, &c.
4. Such as have their Fruit composed of many Acini or round soft Balls (for the Word *Acinus*, in Botany, is rather a Grape than a Grape-stone) set close together like a Bunch of Grapes; as the *Uva Marina*, *Rubus Vulgaris*, *Rubus Idæus*, and the *Rubus minor fructu Cereleo*.

BACCIVOROUS Creatures, are such Animals as feed upon Berries.

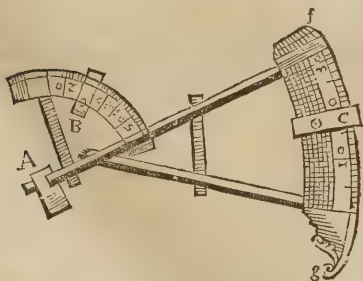
BACCERIND Thief, (a Term in Law) signifying a Thief taken with the Manner (as the say) i. e. having on his Back or about him, those things he hath stolen. It is by some taken for an Offender against Vert or Venison in the Forest.

BACCHIUS, is a Foot of a Latin Verse, consisting of three Syllables, where the first is short, and the two last long, as *Egejus*: This is the Reverse of a *Dactyle*.

BACILLI, are those Medicines which are of a long round Figure like a Stick, &c.

BACK STAYS, of a Ship, see *Stays*.

BACK-STAFF, the same with *Davis's* Qua-



drant, or the *English* Quadrant, as 'tis called by the

BAC

French. 'Twas invented by one Capt. *Davis* a *Welchman*; and is a Sea Instrument of good use to take the Sun's Altitude at Sea. It consists of three Vanes *A*, *B* and *C*; and of two Arches.

The Vane at *A* is called the *Horizon Vane*; that at *B* the *Shade Vane*; and that at *C* the *Sight Vane*. The lesser Ark *B* is of 60 Degrees, and that of *C* (or *f g*) of 30 Degrees. In time of Observation the Shadow Vane *B* is set upon the 60 Arch just to an even Degree of some Altitude less than you judge the Complement of the Sun's Altitude will be, by 10 or 15 Degrees. The *Horizon Vane* is put on at *A*, and the *Sight Vane* on the 30th Ark *f g*; and then the Observer's Back being turned to the Sun (whence the Name of *Back-Staff* or *Back-Quadrant*) he lifts up the Instrument, and looks thro' the *Sight Vane*, rising or falling the Quadrant till the Shadow of the upper Edge of the *Shade Vane* fall on the upper Edge of the Slit in the *Horizon Vane*; and if then you can see the *Horizon* thro' the said Slit, the Observation is well made: But if the Sea appear instead of the *Horizon*, move the *Sight Vane* lower towards *g*; If the Sky appear, move it upwards towards *f*: and so try till it comes right.

Then observe how many Degrees and Minutes are cut by that Edge of the *Sight Vane*, which answers to the *Sight Hole*, and to them add the Degrees cut by the upper Edge of the *Shade Vane*: The Sum is the Sun's Distance from the Zenith, or the Complement of his Altitude.

To find the *Meridian Altitude* by this Instrument, you must continue the Observation as long as you perceive the Altitude to be increasing; which you will find by the Sea's appearing still thro' the Slit instead of the *Horizon*, and as you move the *Sight Vane* lower: But as soon as ever you see the Sky appear instead of the *Horizon*, the Altitude is then diminishing, and you must desist; and adding as before the Degree and Minutes on the two Arks together into one Sum, it gives the Sun's Zenith Distance, or his Co-Altitude; and this subtracted from 90°. leaves the true Altitude above the *Horizon*.

That excellent Astronomer Mr. *Flamsteed*, contrived a Glass Lens or double Convex to be placed in the Middle of the *Shade Vane*, which makes a small bright Spot on the Slit of the *Horizon Vane*, instead of the Shade: And this is a great Improvement, if the Glass be truly made, for by this Means the Instrument may be used in Hazy Weather, and a much more accurate Observation made in clear Weather, than could be by the Shadow.

But after all, this Quadrant is by no Means so accurate as could be wished; and a large heavy Brass Astrolabe must needs be a much better Instrument.

BACULE (in Fortification) is a kind of Port-Cullis or Gate made like a Pit-fall with a Counterpoise, and supported by two great Stakes. 'Tis usually made before the *Corps de Garde* advanced near the Gates.

BACULOMETRY, according to some, is the Art of measuring accessible and inaccessible Lines, by the help of one or more Staves.

BADGER

BADGER (in Law) is one that is Licenced to buy Corn or other Victuals in one Place, and carry it to another.

BAILE or *Bale*; the Seamen call lading or casting the Water by Hand out of a Boat *Bailing*; and when the Water is thus Bailed out, they say, the Boat is freed. They call also those Hoops that bear up the Tilt of a Boat *Bailes*.

BAILE (in Law) is the setting at liberty one Arrested or Imprisoned upon an Action either Civil or Criminal, under Sureties taken for his Appearance at a Day and Place certainly assigned: And there is both *Common* and *Special Baile*; *Common Baile* is in Actions of small Prejudice, or slight Proof, in which Case any Sureties are taken: *Special Baile* is given in Cases of greater Weight, who must be subsidy Men at the least, and they according to the Value.

BAILEMENT (a Term in Law) signifying the Delivery of things, whether Writings or Goods, to another, sometimes to be delivered back to the Bailor, that is, to him that so delivers them, sometimes to the use of him to whom they are delivered; and sometimes to a third Person.

BAILIFF, is an Officer that belongs to a Manor, to order the Husbandry, and hath Authority to pay Quit-Rents issuing out of the Mannor, fell Trees, repair Houses, &c. This Officer is he whom the ancient Saxons called a Reeve.

BAILIFF Errant, is one that the Sheriff makes and appoints to go about the Country to execute Writs, to summon the Country Sessions, Assizes, &c.

BAILIFF Franchises, are those which are appointed by every Lord within his Liberty, to do such Offices within his Precincts, as the *Bailiff Errant* doth abroad in the Country.

BAILIWICK, is the Jurisdiction of a Bailiff within his Lord's Franchise.

See the General Rule for Constructing Equations: See Constructions of Equations.

BALANI, are certain Excreences usually growing to the Shells of the larger sorts of Sea Shell-Fishes.

BALANUS (as it is called by some) or *Glans*, is the Nut of the Yard covered with the Foreskin; sometimes the *Clitoris* is so called. It often also signifies a Suppository. *Blanchard.*

BALL and Socket, is an Instrument made of Brass, with a perpetual Screw to hold any Telescope, Quadrant, or Surveying Instrument, on a Staff for Surveying, Astronomical, or other uses.

BALLANCE or *Libra*, is one of the Six simple Powers in Mechanics, which serves to find out the Equality or Difference of Weights in heavy Bodies. It is only a double Lever whose *Hypomochlion* is at the Centre of its length.

BALLANCE of the Air, see *Barometer*.

BALLANCE of a Watch or Clock, is that part of it, which by its Motion regulates and determines the Beats: The circular Part of it is called the *Rim*, and its Spindle the *Verge*: There belongs to it also two *Pallars* or *Nuts*, which play in the Fangs of the Crown-wheel. In Pocket Watches that strong stud, in which the lower *Pevet* of the *Verge* plays; and in the Middle of which one *Pevet* of the Crown-wheel runs, is called the *Potans*, or rather *Potence*. The wrought Piece which covers the *Ballance*, and in which the upper *Pevet* of the *Ballance* plays, is the *Cock*. The small Spring in new Pocket Watches is called *Regulator*.

BALLANCE or *Libra*, is the Name of one of the twelve Signs of the Zodiac; into the first Degree of which when the Sun comes, the Autumnal Equinox happens, and is the 12th of September.

BALLAST of a Ship, is some heavy Matter, as Stones, &c. laid in the Hold next to the Keelson or false Keel, in order to keep a Ship stiff, so that she may bear the more Sail. The Words about it are *Trench the Ballast*, i. e. divide it into two or more Parts. The Ballast is *Shot*, that is, 'tis run over from one Side to the other: When a Ship hath not Ballast enough, they say she is *Walt*.

BALLESTER, or *Balluster*, in the Capital of the *Ionick Column*, is the lateral Part of the Scroll which makes the *Curl-turf*.

BALLISTA, an ancient Warlike Engine to cast or shoot Darts or Stones, to batter and shake City Walls.

BALLIVO amovendo, is a Writ to remove a Bailiff out of his Office, for want of sufficient living in his Bailiwick.

BALLON or *Balon*, is the French Word for a large Receiver or Vessel used in Chymistry, to receive what is distilled or drawn off by the Fire.

BALLON, in Architecture, is taken for a round Globe, or top of a Pillar.

BALLS or *Ballers*, a frequent Bearing in Coats of Arms; but they are never called so in Heraldry, but according to their several Colours have the following Names;

Besants, when the Colour is Or.

Plates, when 'tis Argent.

Hurts, when 'tis Azure.

Torteauxes, when 'tis Gules.

Pomeis, when 'tis Vert.

Pellets or *Agresses*, when Sable. Some write it *Ogresses*.

Golpes, when Purple.

Orenges, when Tenne.

Guzes, when Sanguine.

And these Nine contain all the Colours usually mentioned Heraldry.

BALLUSTRADE, in Architecture, signifies a Row of little turn'd Pillars, high enough for a Man to rest his Elbows on, fixed upon a Terrace, or upon the Top of a Building; or to make any Separation between one Part of it and another.

BALNEUM, a Word much used by the Chymists; it properly signifies a Vessel of Water, in which the Body or Cucurbite containing any Matter to be distilled is placed, that so the Water heating, may heat the Cucurbite gently and by degrees. And this is what they call corruptly.

BALNEUM Mariæ; but it should be *Balneum Maris*, i. e. a Sea or Water Bath. And in respect to the Mildness of the Heat in this way of Distillation, where the Fire never touches the Cucurbite immediately. They call several other gentle ways of Distillation by the Name of *Balneum*, as.

BALNEUM Vaporosum, where the Vessel containing the Matter to be distilled heated by the Steam of hot or boiling Water.

BALNEUM Arenæ or *Sineris*; which they call also sometimes *Balneum Brenojum*, and *Balneum Cinereum*, is when the Cucurbite, or Retort, or Vessel holding the Matter to be distilled is placed in a Pot of Sand or Ashes, and so is heated by the Heat of the Sand or Ashes.

BALSAM, signifies, 1st. The Juice of an Arabian Tree called *Opobalsamum*, to which are allied the Natural Balsams, as that of *Toli*, *Peru*, &c.

2^{dly}. A sometime thick and odoriferous, spirituous and penetrating Substance, of the Consistence of an Ointment, as *Apoplextick Balsam*, *Balsam of Roses*, &c.

3^{dly}. A sort of Liquors drawn or extracted from Gums and Resinous Substances with Spirit of Wine.

4^{thly}. This Name is given also by the Chymists to the Solutions and Preparations of some Salts, as *Balsam of Saturn*, *Tartar*, *Sal-gemm*, &c.

5^{thly}. Some particular Preparations of Medicines in this Form are called by this Name, as *Balsam of Sulphur*, &c.

BALSAM of Saturn, is a Solution of *Saccharum Saturni* made with Spirit of Oil of *Turpentine*, and digested till the Matter hath gained a Red Tincture.

BAN, is a Proclamation made at the Head of a Body of Troops, or in the several Quarters of the Army, by sound of Trumpet or beat of Drums, either of observing or Martial Discipline, for declaring a New Officer, punishing a Soldier, or the like.

BANDELET, is a French Term for one of the Ornaments in Architecture, which they call also *Regle*: 'Tis greater than the *List*, but a little less than what they call a *Platte Bande*; it encompasses the Pillar quite round about like a Ring.

BANK, in Common Law, signifies the Bench or Seat of Judgment: But there is another sort of *Bank*, where there is a great Sum of Money let out to use, returned by Exchange, or otherwise disposed to Profit.

BANKRUPT, one that hath consumed his Estate, or is run out in his Trade.

BANNIMUS, the Form of Expulsion of any Member from the University of *Oxford*, affixing the Sentence, up in some Publick Place, as a Denunciation or Promulgation of it.

BANQUETTE, in Fortification, is a little Foot Pace or Elevation of Earth in Form of a Step, or the Bottom of a *Parapet*, or that which the Musqueteers get up to discover the *Counterscarp*, or to fire upon the Enemies in the *Moat*, or in the *Counterway*. These *Banquers* are generally a Foot and a half high, and almost three Foot broad.

BARAK or *Baraque*, is an *Hutt* like a little Cottage for Soldiers to lie in the Camp: Formerly those for the Horse were called *Baracks*, and those for the Foot *Hutts*; but now *Barack* is used for both indifferently. They are made usually when the Soldiers have no Tents, or when an Army lies long in a Place in bad Weather, because they keep out Cold and Wet much better than Tents. They are generally made by fixing four strong forked Poles in the Ground, and then laying four others across them; then they build up the Walls with Sods, Wattles, or what the Place affords: The Top is either Planked or Thatched, or covered with Turf, as they have Convenience.

BARBE, a Military Word: To fire an *Barbe* is the fire the Cannon over the *Parapet*, instead of putting them through the Embrazures; but then the *Parapet* must be but 3 Foot and $\frac{1}{2}$ high.

BAROCO, one of the barbarous Words expressing the Syllogistick Moods in Logic; and in this Mood *Baroco*, the first Proposition must be an universal Affirmative, and the two other Negatives.

BAROMETER, is an Instrument for estimating the Minute Variations of the Weight or

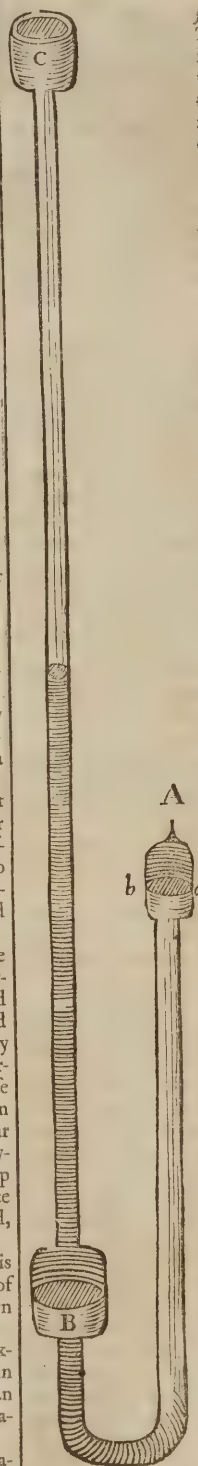
Pressure of the Incumbent Air, consisting of a long Tube of Glass, hermetically sealed at one End, and

being filled with *Quick-silver* (according to the *Torricellian Experiment*) is inverted, so as to have the open End of it immersed in *Stagnant Quick-silver*, contained in a larger Glass under it, and exposed to the Pressure of the outward Air: Out of which open End (after such Immersion) the *Quick-silver* in the Tube being suffered to run as much as it will into the *Stagnant Quick-silver*, in which that Mouth or open End is immersed, there is wont to remain a Cylinder of *Quick-silver*, suspended in the Tube about 28, 29, or 30 Inches high; measuring from the Surface of the *Stagnant Quick-silver* perpendicularly; but more or less within such Limits, according as the Weight or Pressure of the Air incumbent on the external *stagnant Quick-silver* exposed to it, is greater or lesser, leaving the upper Part of the Tube void, or at least empty of common Air.

Dr. Hook's Contrivance to enlarge the Divisions of the *Barometer* in any given Proportion.

The Glass this *Barometer* is represented by the adjoining Figure; the Cylinder *A* may be of what Diameter you please, the bigger the better, but it need not be above two Inches long; the Cane *AD* must be so long, that the upper Part of the Cylinder *B* may be 29 Inches + such a Part of the Height of the other Cane *BC*, as the Weight or Specific Gravity of the Liquor that is to fill that Cane is to the Specific Gravity of *Mercury* below the Line *ab*, in the Cylinder *A*. The third Cylinder *C* may be as high as you please above the Cylinder *B*, but is most conveniently made, so as the Square of the Diameter of the Cane *BC* be to the Square of the Diameter of the Cylinders *B* or *C* (which must be exactly equal) as the rise of the

Mercury



Mercury in the Cylinder *B*, is to the whole Length of the Cane *BC*; for in this case there will be nothing superfluous, but the Divisions enlarged to the utmost advantage.

To fill this *Baroscope*;

Let a small Hole be left at the top of the Cylinder *A*, and another near the top of the Cylinder *B*; this latter being well stopp'd, pour in as much *Mercury* at the other Hole in *A*, as shall fill both Canes as high as the Level of the said Hole; which done, stop either by Hermetically Sealing it, or else by a drop of Sealing-wax (the Glass being first ground rough to make it stick) the Hole in *A*; then opening the Hole in *B*, draw off as much of the *Mercury* of the Cane *BC* till it will run no longer; which done, stop firmly the Hole in *B* (which you may do as you please, there being no Pressure against you) and you will have the Cylinder *A* evacuated of *Air* for your purpose, and the height of the *Mercury* will be as usual in the ordinary *Plain* and *Wheel-Barometers*.

Then pour into the Cane *BC* as much Spirit of Wine tinged with *Chocchine* and Oyl of Turpentine, equal Parts of each, as shall stand above the Surface of the *Mercury*, so many Feet as you make the enlarged Scale of your *Barometer*, or as is between the middle of the Cylinders *B* and *C*, and you will find the *Mercury* sink in the Cane *BC*, and rise in the Cane *AD*, in such proportion, that each 13 Feet of Oyl and Spirit, will raise the *Mercury* 10 Inches: Then you must pour on, by the Cane *BC*, so much *Mercury* as will fill up the Cylinders *A* and *B* to such heights, considering the present weight of the *Atmosphere*, that the Surface of the *Mercury* in both, may at the utmost Limits, (which have not in *England* been found to exceed 30,6 and 28,6 Inches) always fall within the Bodies of the Cylinders, and never enter into the Canes.

The Effect of this *Baroscope* will be, that when the *Atmosphere* is heavy, and the *Mercury* raised high in the Cylinder *A*, and retired out of *B*, the Spirit of Wine will descend into the Cylinder *B*, and the Oyl of Turpentine will fill the Cane, so as to make the Partition of the two Liquors near the Cylinder *B*. But on the contrary, when the Air is light, the *Mercury* will sink in *A*, and rise in *B*, so as to drive the Spirit of Wine into the Cane, and the Oyl of Turpentine into the Cylinder *C*; so that the Section of the two Liquors will be near *C*, and the Variation of the height of the *Mercury* will be enlarged into almost the length of the Cane, without that the Counter-pressure from the Liquors will not be in the least altered, the Height and Weight of the Incumbent Cylinder being always the same.

The Ingenious Mr. *Hawksbee* (that invented the new Cupping-Glasses without Fire, now generally used: See his *Air-pump*) shewed me a *Baroscope* where the *Mercury* rose and fell 60 Inches with very great ease, and without breaking or dividing; and it may very easily be made for 100 or 200 Inches, if a frail small thin Glass Tube can be blown and drawn of that length, and that it were as easily manageable.

The *Torricellian* Experiment is made in a Tube of about 31 Inches in length, with a small Ball, or rather Cylindrical Cavity on the Top; at the Bottom of this Tube, at *A*, is a very small Cistern with *Mercury* in it, and communicating with the free Air, into which the lower End of the Tube *AB* is put; then at a very Acute Angle, is the

small Tube *CD* placed with its open Orifice in the aforesaid Cistern, and just under the Surface of the *Mercury* in it. And thus when the *Atmosphere* is high and heavy (that is in dry and fair Weather) the *Mercury* being pressed up into the Tube *BA*, leaves but little in the Cistern, and consequently there is but a little Weight of *Mercury* there, to press any out into the Tube *CD*, and consequently then the *Mercury* will fall or descend towards *C*. But when in contrary Weather, the *Mercury* falls out of the Tube *AB*, there will be more in the Cistern, and consequently the *Mercury* must ascend further, or run higher up into the Tube *CD*. And this is so tender and nice, that while I was in the Room, and looking on it, which was not above an Hour, the *Mercury* ascended near 2 Inches (for Rain) in the slope Tube.

One great Advantage this Way of managing a sloping Tube, seems to have above the Common One, which is, that the *Mercury* here moves all together in a Body, without breaking or dragging a Tail after it.

See the Figure of the Plate belonging to the Word *Air-Pump*.

Baroscope Statical: So Mr. Boyle calls an Instrument which he invented to estimate the Variations of the Air's Gravity, and is thus describ'd.

A very large and thin Glass Bubble (or if such an one cannot be procured, 2 or 3 smaller ones added together may do) was counterpoised in a very tender Balance which would turn with the 64th Part of a Grain, and then all being hung up in a Frame, he found, that as the Air grew lighter and thinner, the Bubble would preponderate very manifestly; but when the Air grew thicker and denser, the Scale in which the Weights were, would grow heavier, and mount up the Bubble. And this Effect he found would continue and answer exactly to the rise and fall of the *Mercury* in the common *Barometer* or *Baroscope*.

The Grounds on which this Noble Gentleman went in contriving this Instrument, were these:

1. He considered, that tho' at first setting of it up, the Bubble and the Weights would be in *Æquilibrium*, because he carefully made them so; yet the Bulk of the Bubble did exceed that of the Metalline Counterpoise, by near 200 times (be it more or less, according to the Specifick Gravity of the Weights used) and therefore he considered.

2. That, according to the Laws of Hydrostatics, when two Bodies being of the same absolute Weight, but very different Bulks, come to be weighed in another Medium, they can no longer be equiponderant: For if the Medium be heavier or denser, the greater Body will be more buoyed up there than it was before, and constantly will abate of its Weight; but if the Medium should be lighter and rarer, the contrary Effect would follow, and the Weight would be heavier than the Bubble. He considered also, that this must be the Case of the Air, whose Specifick Gravity is continually changing, according to the various Effluvia it receives from the Terraqueous Globe, and consequently, that it must needs be now denser, now rarer, and accordingly more or less buoy up the Bubble.

Our Author hints, that this Instrument is capable of several Improvements; and tho' in many Cases the common *Baroscope* be preferable before it, yet this hath some Advantages above that; as, 1. That this is more parable than the other;

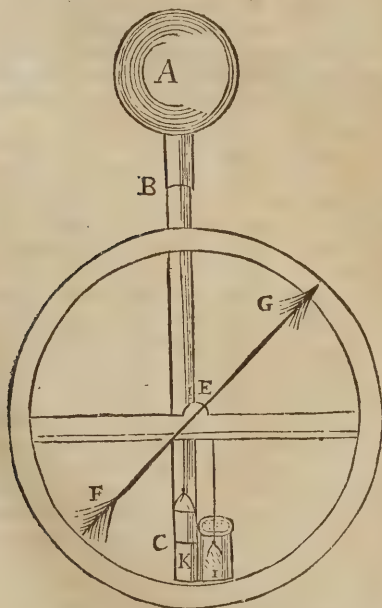
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for many Persons can more easily get a Pair of good Scales and a Glass Bubble, than they can a Tube and Mercury for the common *Baroscope*; and this also is much more easily fitted up than that. This *Stratical Baroscope* is also much more easily carried from Place to Place. This *Baroscope* may be adjusted to the ordinary one, by finding what Weights answer exactly to every half Quarter of an Inch of the rise and fall of the Mercury; and these may help us to guess at the usual Variations of the Weather, by shewing how much is wanting to bring the Scales to an *Equilibrium*.

Also an Arch of a Circle, well graduated, may be fitted so as that the Tongue of the Balance shall play freely by it, and there shew the Change of the Gravity of the Atmosphere, without the Addition of any new Weights at all.

WHEEL-BAROMETER, is a Contrivance for the applying of an *Index* to any Common *Baroscope*, whether the Glass be only a single Cane, or have a round Bolt-head at the Top; and by the Means thereof, the Variation of the Altitude of the *Mercurial Cylinder*, which at most is hardly 3 Inches, may be made as distinguishable as if it were 3 Foot or 3 Yards, or as much more as is desired.

The *Wheel-Barometer* was invented by Dr. Hook, the Manner whereof is visible in the Figure, where *ABC* represents the Tube, which may be either Blunt or with a Head, as *ABC* (by which latter Shape, more room is allowed for any remainder of Air to expand the better.) This is to be filled with Quick-silver, and inverted as commonly, and put



into a Vessel of Stagnant Mercury, made after the Fashion of *IK*, that is, having its Side about 3 or 4 Inches high, and the Cavity of it equally big both above and below; and if it can be (besides that Part which is filled by the End of the *Mercurial Tube* that stands in it) of equal Capacity with the Hollow of the Cane about *B*, for then the Quick-silver rising as much in the Hollow of *I*, as

it descends at *B*, the Difference of the Height in the Receiver *I*, will be just half the usual Difference. And if the receiving Vessel *IK* have a bigger Cavity, the Difference will be less; but if less, the Difference will be greater. But whether the Difference be made hereby bigger or less, 'tis no great Matter, since by the Contrivance of the *Wheel* and *Index*, the least Variation may be made as sensible as is desired, by diminishing the Bigness of the *Cylinder E*, and lengthening the *Index FG*, according to the Proportion requisite.

But this *Wheel-Barometer* not answering fully the designed Exactness, because the Mercury is apt to stick about the Sides of the Glass, and would rise and fall by Leaps, and all at once; and because also 'tis very difficult to adjust the Ball and Thread, &c. and that the Instrument is very apt to be out of Order, &c. 'tis now out of use. And therefore in *Philos. Transact.* N. 185, the Doctor gives us another Contrivance, (which he had thought of in the Year 1668) by putting the Spirit of Wine, or some other Liquor that will not freeze, upon the Mercury; which was designed to rise as the Mercury falls, and fall as it rises. And by this Means he could, he saith, enlarge the Divisions as much as he pleased.

MARINE BAROMETER, is an Instrument contrived by Dr. Hook, for the Use of those that would make a Philosophical Experiment at Sea.

For the *Mercurial Barometer* requiring a perpendicular Posture, and the Quick-silver vibrating therein with great Violence upon any Agitation, is therefore incapable of being made at Sea, (tho' it hath lately been contrived to be made portable) so it remain'd to find out some other Principle, wherein the Position of the Instrument was not so indispensably necessary: For this the above-named Person invented. Its Description and Uses the Ingenious Capt. Halley in *Philos. Transact.* N°. 269. gives as follows.

It is about 40 Years since, that the *Thermometers* of Robert de Fluhibus, depending on the Dilatation and Contraction of included Air by Heat and Cold, have been disused, upon discovery, that the Air's Pressure is unequal; that Inequality mixing it self with the Effects of the Warmth of the Air in that Instrument; and instead thereof, was substituted the sealed *Thermometer* including Spirit of Wine (first brought into England out of Italy by Sir Robert Southwell) as a proper Standard of the Temper of the Air, in relation to Heat and Cold, that *Aethereal Spirit* being of all the known Liquors the most susceptible of Dilatation and Contraction, especially with a moderate Degree of either Heat or Cold.

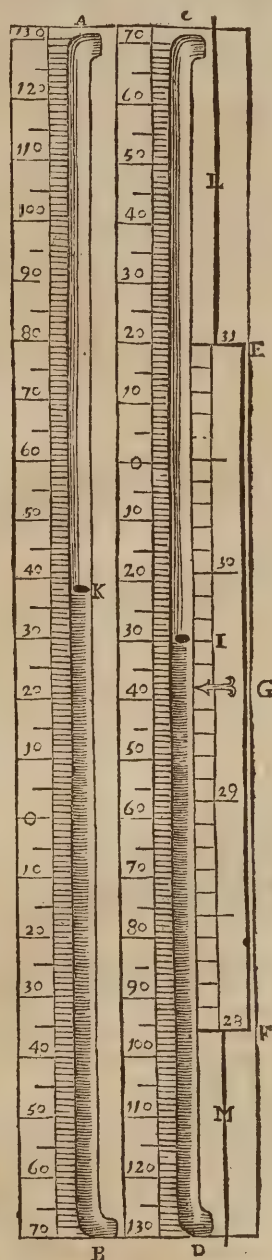
Now this being allow'd as a Standard, and the *Thermometer* that includes the Air being graduated with the same Divisions, so as at the time when the Air was included to agree with the *Spirit-Thermometer* in all Degrees of Heat and Cold, noting at the same time the precise Height of the Mercury in the common *Barometers*; it will readily be understood, that wheresoever these two *Thermometers* shall agree, the Pressure of the Air is the same it was when the Air was included and the Instrument graduated; that if in the *Air-Thermometer*, the Liquor stand higher than the Divisions marked thereon, corresponding with that on the Spirit Glass, it is an Indication that there is a greater Pressure of the Air at that time, than when the Instrument was graduated. And on the

the contrary, it is to be concluded, when the Air-Glass stands lower than the Spirit, *viz.* that then the Air is so much lighter, and the Quick-silver in the ordinary Barometers lower than at the said time of Graduation.

And the Spaces answering to an Inch of Mercury, will be more or less, according to the Quantity of Air so included, and the Smallness of the Glass Cane in which the Liquor rises and falls; and may be augmented almost in any Proportion, under that of the *Specifick Gravity* of the Liquor of the Thermometer to Mercury, so as to have a Foot or more for an Inch of Mercury, which is another great Convenience.

In these Parts of the World, long Experience has told us, That the Rising of the Mercury forebodes Fair Weather after Foul, and an Easterly or Northerly Wind; and that the falling thereof, on the contrary, signifies Southerly or Westerly Winds, with Rain and Stormy Winds, or both; which latter it is of much more consequence to provide against at Sea than at Land; and in a Storm, the Mercury beginning to Rise, is a sure Sign that it begins to abate, as hath been experienced in high Latitudes, both to the Northwards and Southwards of the Equator.

The Form of this Instrument is represented by the following Figure.



AB represents the Spirit Thermometer graduated from 0, or the Freezing Point, through all the possible Degrees of Heat or Cold of the Air, at least in these Climates.

CD is the Air-Thermometer, graduated after the same Manner with the like Degrees.

EF is a Plate applied to the Side of the Thermometer CD, graduated into Spaces answering to Inches, and Parts of an Inch of Mercury, in the Common Barometers.

L 2

G, a Hand standing on the Plate, at the Height of the Mercury thereon, as it was when the Instrument was graduated; as suppose here at 29½ Inches.

L M a Wire on which the Plate EF slips up and down, parallel to the Cane of the Thermometer CD.

K, any Point at which the Spirit stands at the time of Observation; suppose at 38 on the Spirit-Thermometer; slide the Plate EF till the Hand G at 38 on the Air-Thermometer, and if the Liquor therein stand at 38 likewise, then is the Pressure of the Air the same as at the time of Graduation, viz. 29, 5; but if it stand higher, as at 30 at L, then is the Pressure of the Air greater, and the Divisions on the sliding Plate against the Liquor, shew the present Height of the Mercury to be 29, 7 Inches.

This may suffice as to the Manner of using it.

Capt. Halley had one of these Glasses with him in his last Southern Voyage; and he saith, it never failed to give him early Notice of a Storm, and of all the bad Weather they had.

The same Ingenious Gentleman, in *Philos. Transact.* N. 187, hath an excellent Discourse upon the Reasons of the Rise and Fall of the Mercury in Fair and Foul Weather: the Substance of which is as follows.

1. He premises the commonly observed Phenomena of the Mercurial Baroscope; which are,

1. That in Calm Weather, when the Air is inclined to Rain, the Mercury is commonly low.

2. That 'tis generally high in good, serene, settled, fair Weather.

3. That it sinks lowest of all on very great Winds, though they are not accompanied with Rain; with Relation to the Point of the Compass the Wind blows upon.

4. That, *ceteris paribus*, the greatest Height of the Mercury is found, when an Easterly or North-Easterly Wind blows.

5. That in Calm Frosty Weather the Mercury generally is high.

6. That after very great Storms of Wind, when the Mercury hath been low, it usually rises again very fast.

7. That more Northerly Places have a greater Alteration of the Rise and Fall of the Mercury than the more Southerly.

8. That within the Tropicks, and near them, there is little or no Variation of the Mercury's Height in all Weathers.

As to which two last Phenomena's, Mr. Patrick, the Famous Barometer-maker, tells me, That he hath certain Accounts, that the greatest Variation of the Baroscope is in the Latitude of 45°. N. or S. and that the Rise and Fall gradually decreases towards the Equator and Poles, so as in either of those Regions scarcely to vary at all.

The Theory that Mr. Halley advances to solve all which Phenomena, is this:

1. He supposes the principal Cause of the rise and fall of the Mercury, is from the variable Winds, which are found in the Temperate Zones, and whose great Inconstancy here in England is most notorious.

2. A second Cause is the uncertain Exhalation and Precipitation of Vapours lodging in the Air, whereby it comes to be at one time much more crowded than at another, and consequently heavier; but those latter, in a great measure, depend up-

on the former. Now from these Principles, he explicates the several Phenomena of the Barometer.

1. Why in Calm Weather, the Air being inclined to Rain, the Mercury is commonly low?

That the Mercury's being low is an Indication of Rain, because the Air being light, the Vapours are no longer supported thereby, as being become specifically heavier than the Medium wherein they floated; so that they descend towards the Earth, and in their fall meeting with other Aqueous Particles, they incorporate together, and form little drops of Rain; but the Mercury's being at one time lower than at another, is the Effect of two contrary Winds blowing from the Place where the Barometer stands; whereby the Air of that Place is carried both ways from it, and consequently, the incumbent Cylinder of Air is diminished, and accordingly the Mercury sinks; as for Instance, if in the German Ocean it should blow a Gale of Westerly Wind, and at the same time an Easterly Wind in the Irish Sea; or if in France it should blow a Southerly Wind, and in Scotland a Northern, it must be granted me, that that part of the Atmosphere, impendant over England, would thereby be exhausted and attenuated, and the Mercury would subside, and the Vapours which before floated in those parts of the Air, of equal Gravity with themselves, would sink to the Earth.

2. Why in serene, good, settled Weather, the Mercury is generally high? That the greater height of the Barometer, is occasioned by two contrary Winds blowing towards the place of Observation, whereby the Air of other Places is brought thither, and accumulated; so that the Incumbent Cylinder of Air being increased both in Height and Weight, the Mercury pressed thereby, must needs rise and stand high, as long as the Winds continue so to blow; and then the Air being specifically heavier, the Vapours are better kept suspended, so that they have no Inclination to precipitate and fall down in Drops, which is the reason of the serene good Weather which attends the greater heights of the Mercury.

3. Why, upon very great Winds or Storms, though accompanied with no Rain, the Mercury sinks lowest of all, with relation to the Point of the Compass upon which the Wind blows?

This is caused by the very rapid Motion of the Air in these Storms; for the Tract or Region of the Earth's Surface wherein these Winds rage, not extending all round the Globe; that Stagnant Air, which is left behind, as likewise on the sides, cannot come in so fast as to supply the Evacuation made by so swift a Current; so that the Air must necessarily be attenuated when and where the said Winds continue to blow, and that more or less according to their Violence. Add to which, that the Horizontal Motion of the Air, being so quick as it is, may in all probability take off some part of the perpendicular Pressure thereof; and the great Agitation of its Particles, is the reason why the Vapours are dissipated, and do not condense into Drops, so as to form Rain, otherwise the natural Consequence of the Air's Rarefaction.

4. Why, *ceteris paribus*, the Mercury stands highest upon an Easterly or North-Easterly Wind?

This happens because that in the Atlantick Ocean, on this side 35th degree of North-Latitude, the Westerly and South-westerly Winds blow almost always Trade; so that whenever here the Wind comes up at East and North-East, 'tis sure to be check'd

check'd by a contrary Gale, as soon as it reaches the Ocean; wherefore, according to what is made out in the Second Remark, the Air must needs be heaped over this Island; and consequently the Mercury must stand high, as often as these Winds blow. This holds true in this Country, but is not a general Rule for others, where the Winds are under different Circumstances; and he himself hath sometimes seen the Mercury here as low as 29 Inches upon an Easterly Wind, but then it blew exceeding hard, and so comes to be accounted for by what was observed upon the third Remark.

5. *Why in calm frosty Weather the Mercury generally stands high?*

The Cause thereof is, That it seldom freezes but when the Winds come out of the Northern and North-Eastern Quarters; or at least, unless those Winds blow at no great distance off, for the Northern Parts of Germany, Denmark, Sweden, Norway, and all that tract from whence North-Eastern Winds come, are subject to almost continual Frost all the Winter; and thereby the lower Air is very much condensed, and in that state is brought hitherwards by those Winds, and being accumulated by the Opposition of the Westerly Wind blowing in the Ocean, the Mercury must needs be prest to a more than ordinary height, and as a concurring cause, the shrinking of the lower Parts of the Air into lesser room by cold, must needs cause a descent of the upper Parts of the Atmosphere, to reduce the Cavity made by this Contraction to an Equilibrium.

6. *Why after very great Storms of Wind, when the Mercury has been very low, it generally rises again very fast.*

This, he tells you, he has frequently observed, and once found it risen an Inch and a half in less than six Hours, after a long continued Storm of South-West Wind. This seems to be occasioned by the sudden accession of new Air to supply the great Evacuation which such continued Storms make thereof in those places where they happen, and by the Recoil of the Air, after the Force ceases that impelled it; and the reason why the Mercury rises so fast, is, because the Air being very much rarified beyond its mean Density, the neighbouring Air runs in the more swiftly to bring it to an Equilibrium; as we see Water runs the faster for having great Declivity.

7. *Why in more Northern Places, the Variations of the Barometer are greater than in more Southerly?*

The Truth of the matter of fact is proved from Observation made at Clermont and Paris, compared with others made at Stockholm, as may be seen in the Appendix to Mr. Pascal's Book, *De l'Equilibre des Liquors*. The Reason seems to be, that the more Northern Parts have usually greater Storms of Wind than the more Southerly, whereby the Mercury should sink lower in that Extrem; and then the Northern Winds bring the condensed and ponderous Air from the Neighbourhood of the Pole, and that again being check'd by a Southerly Wind, at no great distance, and so heaped, must of necessity make the Mercury in such case stand higher on the other Extrem.

8. *Why near the Equinoctial, as at Barbadoes and St. Helena, there is very little or no Variation of the Height of the Barometer?*

This Remark, above all others, confirms the Hypothesis of the variable Winds, being the cause of these Variations of the Height of the Mercury, for

in the places above-named, there is always an easy Gale of Wind blowing nearly upon the same Point, viz. E. N. E. at Barbadoes, and E. S. E. at St. Helena, so that there being no contrary Current of the Air, to exhaust or accumulate it, the Atmosphere continues much in the same state: However, upon Hurricanes, the most violent of Storms, the Mercury has been observed very low but this is but for once in 2 or 3 Years, and it soon recovers its settled state of about 29½ Inches: And there is no doubt but the same thing is in the East Coast of Africa, and in India, where the Monsoons or Winds are Trade for half the Year one way, and half the Year another; only 'tis probable, that there may something worth noting happen, about the time of the change or shifting of the Winds; which might be obtained if any Body had the Curiosity to keep the Barometer at our Factories in India.

Snowden Hill in North-Wales was measured by Mr. Caswell with Mr. Adams's Instruments, and found to be 1240 Yards high.

Mr. Halley found by 3 exact tryals the Mercury in the Baroscope descended at its top 3 Inches, 8 Tenths, and something more, and perhaps 4 Inches may be near enough Truth; if so, then divide 1240 by 4, the Quotient is 310 Yards; so that any fall of the Mercury 1 Inch, argues an Ascent of just 310 Yards in height; but according to Mr. Halley's Account of 3, 8 Inches, he makes 30 Yards height to answer to one tenth of an Inch fall; we therefore allow just 30 Yards (for Mr. Halley thought the fall of the Mercury more than 3, 8 Inches;) if so, then if Dr. Hook's new Baroscope will bear Divisions of one tenth of an Inch into ten more sensible Parts (as I believe it will) each of those ten Parts will answer to 3 Yards, and so by its help one may take the Level of Places very well, to convey Water, &c.

When the Mercury is at 30 Inches in the Baroscope (whence may be computed the middle height) the Atmosphere is 5 Miles and ½ high (that is, supposing the Air to be of the same Density all along; tho' in all probability it is not, but grows more rare in proportion to its Height, which will much encrease the Height of the Atmosphere.)

The Ingenious Mr. Derham, Rector of Upminster, in *Philos. Transf. N. 236*, gives an Account of some Experiments he made at the Top and Bottom of the Monument; where he found, that at the Height of 32 Feet, the Mercury fell ⅙ of an Inch; and at about 164 Feet, ⅔ of an Inch, &c.

He there also describes a Portable Barometer; which he conceives might be of great use in such Experiments.

In *Philos. Transf. N. 237*, he gives a Contrivance to measure the Height of the Mercury in the Barometer, by a Circle on one of the Weather Plates, to the Hundredth Part of an Inch exactly.

In *Philos. Transf. N. 240*, Mr. Stephen Gray shews also a Method of measuring the Height of the Mercury in the Barometer, by adapting a double Microscope furnish'd with a Micrometer to the Baroscope, by Means of which, the Mercury's Variations may be observed to the Thousandth Part of an Inch.

The following Rules to judge of the Weather by the Barometer, I had from Mr. John Patrick in Ship-Court in the Old Baily, the Torricellian Operator; and they are the Result of his own long Experience and Observation.

Rules and Observations on the various Rising and Falling of the Mercury, to foreknow the Weather by the Barometer.

1. It hath been observed, That the Motion of the Mercury doth not exceed 3 Inches in its rising or falling, in the *Barometer* of the Common Form.

2. That its least Alterations are to be minded, in order to the right finding the Weather by it.

3. The rising of the Mercury presages, in general, fair Weather; and its falling, Foul, as Rain, Snow, high Winds, and Storms.

4. In very hot Weather the falling of the Mercury forebushes Thunder.

5. In Winter the Rising presages Frost; and in frosty Weather, if the Mercury falls three or four Divisions, there will certainly follow a Thaw; but in a continued Frost, if the Mercury rises, it will certainly Snow.

6. When foul Weather happens soon after the falling of the Mercury, expect but little of it; and judge the same when the Weather proves fair soon after the Mercury has risen.

7. In foul Weather, when the Mercury rises much and high, and so continues for two or three Days before the foul Weather is over, then expect a continuance of fair Weather to follow.

8. In fair Weather, when the Mercury falls much and low, and thus continues for two or three Days before the Rain comes, then expect a great deal of Wet, and probably high Winds.

9. The unsettled Motion of the Mercury denotes uncertain and changeable Weather.

10. You are not so strictly to mind the Words that are engraven on the Plates, tho' for the most part it will agree with them, as the Mercury's rising and falling; for if it stands at much Rain, and then rises up to changeable, it presages fair Weather; altho' not to continue so long as it would have done if the Mercury were higher; and so on the contrary.

And I think my self obliged in Justice to tell the World, That I have never seen better Weather-Glasses of all kinds made any where, than by Mr. Patrick; who doth really deserve all possible Encouragement for the many Experiments he hath made in order to improve the *Barometer*, and which he is always very willing to shew to all Ingenious and Curious Persons. And tho' I cannot be of Dr. Leigh's Opinion, who in P. 16. and 180 of his *Natural History of Lancashire*, &c. saith, Mr. Patrick's Experiments demonstrate, that the Suspension of the Mercury in the Tube is not caused by the Weight of the Incumbent Atmosphere, since on a very careful Examination of all Mr. Patrick's Experiments, I find them all accountable by the Doctrine of the Gravitation of Fluids; yet do I really believe the making and considering those Experiments, hath given Mr. Patrick many useful Hints for the Improvement of this Instrument, and will continue to do so daily. His *Pendulous Barometer* is very curious and nice, the Scale being graduated for it by an Air-Pump; it hath no Cistern of Stagnant Mercury at the Bottom of the Tube, as in the common Torricellian Experiment; and the Mercury rises and falls about 12 Inches instead of 3, as in the ordinary Barometer: And in a *Diagonal* one (which he very handsomely fits about the Frame of a large Looking-Glass, with a Thermometer also by it the Mercury rises and falls near 30 Inches; and) consequently, the changes of the Weather will be much

sooner perceptible in these Instruments, than in the *Barometers* of the common Form.

BARON and *Feme*; the Term in Heraldry, when the Coats of Arms of a Man and his Wife are born *per Pale* in the same Escutcheon, the Man's always on the *Dexter* Side, and the Woman's on the *Sinister* or Left. But here the Wife is not an Heiress, for then her Coat must be born by the Husband on an Inescutcheon or Escutcheon of Pretence.

At Common Law these words signify only a Man and his Wife.

BAROSCOPE, the same with *Barometer*: Which see.

BARR of the Port: See *Shackles*.

BARR, in Heraldry, is a smaller *Fesse*, containing but the fifth Part of the *Field*, whereas the *Fesse* contains the *Third*.

BARR (in Law) is when the Defendant in any Action pleads a Plea which is a sufficient Answer, and destroys the Action of the Plaintiff for ever.

BARR FEE, is a Fee of twenty Pence, which every Prisoner acquitted of Felony pays to the Sheriff or Goaler.

BARREL, is a pretty large Cavity behind the *Tympanum* of the Ear; it is about three or four Lines deep, and five or six wide. It is lined with a fine Membrane, on which there are several Veins and Arteries. In this Cavity there are four small solid Bones, not covered with a *Periosteum* as the rest of the Bones of the Body are.

BARREL: See in *Fusley*.

BARRELS of Earth, used in Fortification, are as it were half *Hogheads*, which being fill'd with Earth, serve for Parapets; as also to break the Galleries made in the Ditch, and to roll into the Breaches.

BARRETOR (in Law) signifies a common Wrangler, stirrer up, or maintainer of Suits and Quarrels, either in Courts or in Country.

BARRETRY, a Word used in Policies of Insurance for Ships, and signifies Dissentions and Quarrels among the Officers and Seamen.

BARRIERS, in Fortification are great Stakes, about four or five Foot high, placed at the distance of eight or ten Foot one from another, with their Transoms or overwart Rafter, to stop either Horse or Foot that would enter or rush in with Violence. These *Barriers* are commonly set up in the void Space between the Cittadel and the Town in Half-moons, &c.

BARRICADO, a Warlike Defence of empty Barrels and such-like Vessels fill'd with Earth, Carts, Trees cut down, against an Enemy's Shot or Assault; but generally are Trees cut with six Faces, which are cross'd with Battoons as long as a Half-Pike, bound about with Iron at the Feet. These are usually set up in Passages or Breaches to keep back as well the Horse as Foot.

BARRISTERS, in Common Law, are of two sorts; 1. The Outward or *Uter Barristers*, who by their long Study in, and Knowledge of the Law (which must be for a Term of seven Years at least) are called to publick Practice, and undertake the Defence of their Clients Causes: These always plead without the Barr. 2. The *Inner Barristers*, who because they are either *Attorney*, *Solicitor*, *Serjeant*, or Council to the King, are allowed, out of Respect, the Privilege of Pleading within the Barr. But at the Rolls and some other inferior Courts, all *Barristers* are admitted within the Barr. *Blunt*.

BARRULET, in Heraldry, is the Half of the *Closet*, and the Quarter of the *Barr*.

BARRY, when an Escutcheon is divided *Bar-ways* into an even Number of Partitions; 'tis to be expressed in Blazon by the Word *Barry*, and the number of Pieces is to be specified. But if the Divisions be odd, then the Field must be first nam'd, and the number of Bars express'd. See *Paly*.



BARRY-BENDY, is when an Escutcheon is divided evenly, both *Barr* and *Bend-ways*; as thus.

Barry, Bendy, Argent, and Sable.



BARRY-PILY, is when a Coat is thus divided; and 'tis to be Blazoned, *Barry-Pily*, of eight Pieces.

Vid. Guillim, P. 279.

BARTER, a Word used for the Exchange of Wares for Wares.

BARYPHONY, is a Difficulty in Speaking.

BASE, in Fortification, is the exterior Side of the Polygon, viz. the Imaginary Line which is drawn from the *Flank'd Angle* of a *Bastion* to that which is opposite thereto.

BASE or *Basis*, in Architecture, is the Foot of a Pillar that sustaineth it, or that Part which is under the Body, and lies upon the Pedestal or Zocle when there is any: Therefore 'tis not used for the lowest Part of a Column, but for all the several Ornaments or Mouldings which reach from *Apophyses* or the rising of the Shafts of Pillars to the Plinth.

BASE FEE, or *Base Estate*, is a holding at the Will of the Lord.

BASE COURT (in Law) is any Court that is not of Record.

BASE of a *Triangle*, any one Side of a *Triangle* may be called the *Base*, but usually, and most properly that Side which lies parallel to the *Horizon* is taken for the *Base*. 'Tis also the same as to any other Right lin'd Figure.

BASE of any *Solid Figure*, is its lowermost Side, or that on which it stands.

BASE, of a *Conick Section* (if it have one) is a Right Line in the *Hyperbola* and *Parabola*, arising from the common Intersection of the *Secant Plane* and the *Base* of the *Cone*.

BASE, the least sort of Ordnance, the Diameter of whose Bore is 1½ Inch, Weight 200 Pound, Length 4 Foot, Load 50 Pound, Shot ½ Pound Weight, and 1½ Inch Diameter.

BASE RING, of a Cannon, is the great Ring next behind the Touch-hole.

BASE POINT, in an Escutcheon: See *Escutcheon*.

BASE TENURE, or holding by Villanage or other customary Service, as distinguish'd from the Higher Tenure, in *Capite*, or by Military Service.

BASILARE OS, the same with *Sphenoides*.

BASILICA, is the inner Vein of the Arm, called *Hepatica*, the Liver Vein, it being the inferior

Branch of the *Axillaris*, divided into 3 Branches under the Tendon of the *Musculus Pectoralis*.

BASILICA, in the Ancient Architecture, was a great Hall which had two Ranges of Pillars, and two Isles and Wings with Galleries over them. These great Halls were at first made for the Palaces of Princes, afterwards they were turned into Courts of Justice, and at last into Churches.

BASILICK CONSTITUTIONS, were an Abridgment and Reform of the Laws of *Justinian*, made in the Reigns of *Basilus* and *Leo* (whence they had their Name) and were in force in the Eastern Empire till its Dissolution.

BASILICUS, *Cor. Leonis*, a fixed Star of the first Magnitude in the Constellation *Leo*; its Longitude is 145°. 21'. Latitude 00, 26'. Right Ascension 147 Deg. 47. Min.

BASIOGLOSSUM (see *Hypploglossum*) is a Pair of Muscles that depress the Tongue: It arises fleshy from the Basis of the Os *Hyoides*.

BASIS, in Anatomy is the upper and broader Part of the Heart, opposite to the *Mucro* or Point: Also the Foundation of the Bone *Hyoides*.

BASKETS of Earth: See *Corbeils*.

BASIS, in Music, is the lowest of all the Parts thereof, which serves as a Foundation to the others.

BAS-RELIEF: See *Relief*.

BASS ENCEINT, or *Bass Enclosure*, the same with the *Fausse Bray* in Fortification, which see.

BASTON, in Fortification, is now what was anciently called a *Bulwark*: It consists of two *Faces*, as many *Flanks*, formerly a *Gorge*. It is usually made at the Angles or Forts, of a large heap of Earth, sometimes lined with Stone, but usually faced with Sods. The Lines terminating it are two *Faces*, two *Flanks*, and two *Demigorges*. The Union of the two *Faces* makes the outmost Angle, called the *Angle of the Bastion*. The Union of the two *Faces* to the two *Flanks*, makes the *Side Angles* called the *Shoulders* or *Epaules*; and the Union of the two other Ends of the *Flanks* to the two *Curtains*, forms the *Angles of the Flanks*.

BASTIONS Solid, are those that have their Earth equal to the Height of the *Rampart*, without any void Space toward the Centre.

BASTIONS Void or Hollow, are those that have a *Rampart* and *Parapet* ranging only round about their *Flanks* and *Faces*, so that a void Space is left toward the Centre, and the Ground is there so low, that if the *Rampart* be taken, no Retrenchment can be made in the Centre, but what will lie under the Fire of the Besieged.

FLAT BASTION, is that which is built on a Right Line.

CUT BASTION, is that which makes a Retrenching Angle at the Point; and is sometimes called,

BASTION with a Tenaille, whose Point is cut off, and makes an Angle inwards, and two Points outwards: This is done when Water, &c. hinders carrying the Bastion to its full extent, or when it should be too sharp.

BASTION Composed, is when the two Sides of the interior Polygon are very unequal, which makes the *Gorges* also unequal.

BASTION Deformed, is that which wants one of its *Demi-Gorges*, because one Side of the Interior Polygon is so very short.

BASTION *Demi*, hath but one Face and Flank, and is usually before a Horn-work or Crown-work. This is also called an *Epaulement*.

BASTION *Double*, is that which on the Plain of the great Bastion hath another Bastion built higher, leaving 12 or 18 Feet between the Parapet of the lower and the Foot of the higher.

BASTION *Flat*, if the Distance between the Angles of the Interior Polygon be double the usual length, then a Bastion is made in the middle before the Curtain; but it generally hath this disadvantage, that unless there be an extraordinary Breadth allowed to the Moat, the turning Angle of the Counterfcarp runs back too far into the Ditch, and hinders the Sight and Defence of the 2 opposite Flanks.

BASTION *Regular*, is that which hath its due proportion of Faces, Flanks and Gorges.

BASTON, a *French* word in Architecture, the same with the *Tore*; in Heraldry the same with *Abuton*: Which see.

BATHMIS, is a Cavity in the Bone of the Arm or Shoulder, on each side one; whereinto, when the whole Hand is stretched forth and bended, the Process of the undermost and lesser of the long Bones of the Cubit enters. This is also called *Trochlea*.

BATRACHUS, is a Tumour under the Tongue, which makes Men croak like a Toad, when they speak. *Blanchard*.

BATTAILE, is an ancient Trial in our Law, which the Defendant in Appeal of Murder, Robbery, or Felony, might chuse, that is to fight with the Appellant, for proof whether guilty or not; grown obsolete and wholly disused.

BATTALION, is a Body of Infantry of about 6, 7, or 800 Men, of which usually $\frac{1}{4}$ are Pikes in the middle, and the other $\frac{3}{4}$ are Muskets posted on the Wings; But the Number of Men is by no means certain. *Battalions* are usually drawn up six deep, or with six Men in File, or one before another; those in length or side by side being called *Ranks*. Some *Regiments* consists of but one *Battalion*; but when they are Numerous they are divided into several *Battalions* according to their Strength; and so that every one may be about 7 or 800.

The *Battalions* of *French* Guards have commonly but 5 Companies, because each Company consists of 150 Men. But of other *French* *Regiments* there go 16 Companies to a *Battalion*, because they are but 50 Men in a Company. Of the *Swiss* Guards 4 Companies make a *Battalion*, because each Company hath 180 Men.

When a *Battalion* is to be formed out of the Companies of several *Regiments* in a Garrison, &c. then those of the Eldest *Regiments* post themselves on the Right; those of the Second on the Left, and so all other successively on the Right and Left, till the youngest fall into the Centre. The Subaltern Officers take their Post before their Companies, the Captains on the Right and Left according to their Degree.

Battalions are divided into 3 Divisions, the Musqueteers in the Right and Left, and the Pikes in the middle. In Marching, when there is not Room for so great a Front, they break into Subdivisions as the Way and Ground will allow.

The great Art of drawing up a *Battalion* is to dispose it so as that it may best resist a Party of Horse in an open Field, and that it may with advantage engage with either Horse or Foot.

BATTERY (in Law) is an Act that tends to the breach of the Peace of the Realm.

BATTERY, in Fortification, is a place raised on purpose where Cannon are planted, from thence to play upon the Enemy; the Platform on which they are fix'd being made of Planks that support the Wheels of Carriages, so as to hinder the Weight of the Cannon from sinking them into the Ground, and incline somewhat towards the Parapet to check the Recoiling of the Pieces.

BATTERIES of a *Camp*, are Places to plant great Guns on, and are usually surrounded with a Trench and *Pallisadoes* at the Bottom, as also with a Parapet on the top, having as many Holes as there are Pieces of Artillery; and with two Redouts on the Wings, or certain Places of Arms capable of covering the Troops that are appointed for their Defence.

In all Batteries the open Spaces left to put the Muzzles of the great Guns out, are called *Embrasures*, and the Distances between the *Embrasures* *Merlons*. The Guns are generally about 12 Foot distant one from another, that the Parapet may be strong, and the Gunners have room to work.

BATTERY *Sunk* or *Buried*, is when its Platform is sunk or let down into the Ground so that there must be Trenches cut in the Earth against the Muzzles of the Guns, for them to fire out at, and to serve for *Embrasures*. This sort of Battery which the *French* call *En Terre*, and *Ruinante*, is generally used on the first making of Approaches, to beat down the Parapet of any Place.

BATTERIES *Cross*, are two Batteries which play athwart one another upon the same thing, forming there an Angle, and beating with more Violence and Destruction, because what one Bullet shakes, the other beats down.

BATTERY *d' Enfilade*, is one which scours or sweeps the whole Length of a Strait Line.

BATTERY *en Echarp*, is that which plays obliquely.

BATTERY *d' Revers*, or *Murdering Battery*, is one that bears upon the Back of any Place.

BATTERY *Joint*, or *par Camerade*, is when several Guns play at the same time upon one Place.

BATTEURS *d' Estrade*, or *Scours*, are Horsemen sent out before, and on the Wings of an Army, a Mile, or two, or three, to make Discoveries; which they give an account to the General.

BATTLEMENTS, are the Tops of the Walls of Buildings made in the Form of *Embrasures* and *Merlons*, as in Fortified Places.

BATTOLOGY, is a vain and foolish Repetition of the same Words over and over again in any Discourse; like the trifling Poet *Batrus* mentioned by *Ovid*, who introduces him saying, *Montibus (inquit) erant et erant sub montibus illis*.



BATTOONE, a Term in Heraldry, signifying a 4th Part of a *Bend sinister*: It is the usual Mark of Illegitimacy, and is always born coupé, or cut off after this manner.

It also signifies the Earl Marshall's Staff.

BAY, is a Term used by Geographers and Seafaring Men, for an Arm of the Sea coming up into the Land, and terminated in a Nook. It is a kind of Lesser Gulph, bigger than a Creek, and

larger in the Middle within, than 'tis at the Entrance into it; which Entrance is called the *Mouth of the Bay*.

BEACONS, are Fires maintained on the Sea-Coasts, to prevent Ship-wracks, and to give notice of Invasions, &c.

BEADLE (in Law) signifies a Messenger or an Apparitor of a Court, that cites Men to the Court to appear and answer.

BEAK, or *Beak-head*, of a Ship, is that Part of it which is fastened to the *Stem*, and is supported by a *Knee*; and is the becoming Part or Grace of a Ship.

BEAM COMPASSES, is an Instrument made in Wood or Brass, with sliding Sockets to carry several shifting Points, in order to draw Circles with very long Radii: They are of good use in large Projections for drawing the Furniture on Wall Dyals, &c.

BEAMS of a Ship, are the great main cross Timbers which hold the Sides of a Ship from falling together, and which also support the *Decks* and *Orlops*. The *Main Beam* is next the *Main Mast*, and from it they are reckoned by First, Second, or Third Beam. The great Beam of all is called the *Midship Beam*.

BEAR, a Word used by Seamen in several Senses. They say a Ship *Bears Ordinance*, when she carries any great Guns: She *Bears a good Sail*, they say, when a Ship having her Sails abroad in a Gale of Wind, sails upright in the Water. When a Ship sails toward the Shore, she is said to *bear in with the Land*: When a Ship that was to Windward comes under another Ship's Stern, and so gives her the Wind, she is said to *Bear under her Lee*. If a Ship sails into an Harbour with the Wind large, or before the Wind, she is then said to *Bear in with the Harbour*; and when a Ship keeps off from any Land, she is to *Bear off from it*. When a Seaman would express how any Cape or Place lieth from another, he saith it *beareth off so, or so*. In Conding also, they say, *Bear up the Helm*, i. e. let the Ship go more large before the Wind; and *Bear up Round*, that is, let the Ship go between her two *Sheets*, directly before the Wind. Lastly, There is another Sense of this Word in reference to the *Burthen* of a Ship (which Word is derived from hence) for they say a Ship *Bears*, when having too slender or *Lean* a Quarter she will sink too deep into the Water, with an over-light Freight, and thereby can carry but a small Quantity of Goods.

BEAR, is also used in Heraldry: He that hath a Coat of Arms is said to *Bear* in it the several Charges or Ordinaries that are in his Escutcheon; as if there are 3 Lions Rampant in it, he is said to *Bear 3 Lions Rampant*.

BEAR; there are two Constellations of the Stars called by this Name, the *Greater* and *Lesser Bear*, or *Ursa Major* and *Minor*. The Pole Star is said to be in the Tail of the *Lesser*, because that Star is never above 2 Degrees distant from the N. Pole of the World.

BEARING, in Navigation, signifies the Point of the Compass that one Place *bears* or stands off from another.

BEASANTS: See *Balls*.

BEATS, in a Watch or Clock, are the Strokes made by the *Wings* or *Pallets* of the Spindle of the Ballance; or of the *Pads* in a Royal Pendulum.

To find the *Beats* of the Ballance in all Watches going, or in one turn of any *Wheel*.

Having first found out the number of Turns which the *Crown-wheel* hath in one turn of the *Wheel* you seek for (by the Direction given under the Word *Turn*) and then those turns of the *Crown-wheel* multiply'd by its Notches, will give you half the number of *Beats* in that one turn of the *Wheel*: because the *Ballance* or *Swing* hath two Strokes to every Tooth of the *Crown-wheel*: For each of the two *Pallets* hath its Blow against each Tooth of the *Crown-wheel*: Wherefore it is, that a Pendulum that strikes Seconds, hath its *Crown-wheel* only 30 Teeth. To explain what hath been said, take this Example (being the Numbers of a Sixteen

Hour Watch) wherein the Pinion of
 4) 32 (8 Report is 4, the *Dial-wheel* 32, the
 Great-wheel 55, the Pinion of the
 5) 55 (11. *Second-wheel* 5, &c. The Number
 5) 45 (9. of Notches in the *Crown-wheel* 17,
 5) 40 (8. being multiplied into 6336 (the Product arising from the continual Multiplication of the Quotients 8, 11, 9, 8) gives 107712 for half the number of *Beats* in one turn of the *Dial-wheel*; for 8 times 17 is 136, which is half the number of *Beats* in one turn of the *Centrate-wheel* 40; and 9 times 136 is 1224, the half *Beats* in one turn of the *Second-wheel*; and 11 times 1224 is 13464, the half *Beats* in one turn of the *Great-wheel* 55; and 8 times 13464 makes 107712, before found. Which, if multiplied by the two *Pallets*, that is, double it, it gives 215424, which is the number of *Beats* in one turn of the *Dial-wheel*, or 12 Hours. If you would know how many *Beats* this Watch hath in an Hour, 'tis but dividing the *Beats* of 12 Hours into 12 Parts, and it gives 17952, the Train of the Watch, or *Beats* in an Hour. If this be divided into 60 Parts, it gives 299, and a little more, for the *Beats* in a Minute. And so you may proceed to Seconds and Thirds if you will.

By the *Beats* and Turns of the *Fusy*, the Hours that any Watch will go, may be found thus;

As the *Beats* of the Ballance in one Hour: Are to the *Beats* in one Turn of the *Fusy*: So is the number of the Turns of the *Fusy*: To the continuance of the Watches going:

Thus, 20196 : 26928 :: 12 : 16.

To find the *Beats* of the Ballance in an Hour; the Proportion is,

As the Hours of the Watches going: To the number of Turns of the *Fusy*: So are the *Beats* in one Turn of the *Fusy*: To the *Beats* in an Hour:

Thus, 16 : 12 :: 26928 : 20196.

To find the *Beats* of a Ballance in one Turn of the *Fusy*; you have this Proportion;

As the number of the Turns of the *Fusy*: Is to the continuance of the Watches going in Hours: So are the *Beats* in one Hour: To the *Beats* of the Ballance in one Turn of the *Fusy*:

That is, 12 : 16 :: 20196 : 26928.

BECHICKS, are Medicines good against a Cough. They are called also *Herbical Medicines*, *Blanchard*.

BED, of the Carriage of a Great Gun, is that thick Plank which lies immediately under the Piece, being as it were the Body of the Carriage.

BELANDRE, is a sort of little Vessel with Sails and Tackle like an Hoy, but Broader and Flatter: The covering of the Deck is raised up half a Foot higher than the Gunwale, Gunnel, or *Plat-board*, as the *French* call it, and between the Gunnel and the Deck there is a Passage left free, for the Seamen to walk upon: They are chiefly used to carry Merchant's Goods, and are seldom above 24 Tun.

Some will have them called *Pylanders*, because they seldom go out of sight but Sail by the Land.

BELAY, aboard a Ship, signifies the same as *Eastern*: Thus they say *belay the Sheat*, or *Tack*, that is, *fasten it to the Kennel*, &c.

BELENOIDES, is the process or shooting forth of the Bone called *Aliformis*, which is fixed in the Basis of the Skull. *Blanchard*.

BELLANDER: See *Belandre*.

BEND; at Sea they say *Bend the Cable*, when 'tis to be seized and made fast to the Ring of the Anchor; and to *Bend two Cables*, is all one with them as to tie them together. To *unbend the Cable* is to loosen it from the Ring of the Anchor, which is done when a Ship designs to be long at Sea. To *bend a Main-Sail*, is to make it fast to the Yard in its proper place.

BEND, one of the eight Honourable Ordinaries in Heraldry, containing a 5th when uncharged, but when charged a 3d. part of the Escutcheon. It's made by 2 Lines drawn thwartways from the *Dexter Chief* to the *Sinister Base Point*; thus. He beareth Or, a *Bend Sable*.



A *Bend* is subdivided into a

BENLET, which is the 6th part of the *Shield*; a *Garret*, which is the Moiety of a *Bend*; a *Cot*, which is the 4th part of a *Bend*; and a *Ribbon*, which is the Moiety of a *Cot*.

There is also a *Bend Sinister*, which is drawn from the *Sinister chief Point* to the *Dexter base*, and this is subdivided into the *Serape* or *Scarp*, and the *Batoone*, which latter is the 4th part of the *Bend*.

This *Batoone* is the most usual Mark of Illegitimacy, but then it never extends it self quite athwart the *Shield*, but is cut off a little at each End.

When 2 straight Lines drawn within the *Bend* run nearly parallel to the outward Edges of it, that is called *Voiding*, and he that bears it is said to bear a *Bend voided* thus



He beareth *Ermine*, a *Bend voided Gules*.

BENDY, the Term in Blazonary for an Escutcheon being divided *Bendways* into an even Number of Partitions; but if they are odd the Field must first be named, and then the Number of the *Bends*.

BENIGN Diseases, are those which are not attended with *Anomalous*, and extremely Violent Symptoms.

BERME, in Fortification, is a little Space of Ground three, four, or five Foot wide, left without, between the Foot of the *Rampart* and the side of the *Moat*, to receive the Earth that rolls down from thence, and to prevent its falling into the *Moat*. Sometimes for more Security the *Berme* is *Palisaded*.

BERTYING a *Ship*, by some is meant the raising of the Ship's Sides.

BESAIL (in Law) is a Writ that lies for the Heir, where his Great Grand-father was seized the Day that he died, or died seized of Land in Fee-simple, and a Stranger enters the Day of the Death of the Great Grand-father, or abates after his Death, his Heir shall have a Writ against such a Disseisor or Abater.

BEVEL, an Instrument well known to Builders, Carpenters, and Bricklayers, and used adjusting of Angles.

BEVILLE, a Term in Heraldry, signifying Broken, or opening like a Carpenter's Rule. Thus he beareth *Argent a chief Beville vert*, by the Name of *Beverlis*.



BEWPLEADER, is a Writ that lies where the Sheriff, or other Bailiff in his Court will take a Fine of the Party, Plaintiff or Defendant, to the end that he shall not plead fairly, &c.

BEZANTS or *Besants*, a Term in Heraldry for Round Plates of Gold without any Stamp, which are born frequently in Coats of Arms: *Guillim* says, a *Besant* or *Besant* is taken for a Massy-Plate of Gold of 101 lb. and 2 Ounces weight; tho' some think they were smaller Pieces stamp'd at *Bizantium* or *Constantinople*; whence the Name.

BEZOAR *Animale*, according to some, is the Liver and Heart of Vipers dried and powdered.

BEZOAR *Minerale*, is an Evaporation of the Solution of Butter of Antimony in Spirit of Nitre, till a white Mass remain at the bottom: On this new Spirit of Nitre is poured, and the Liquor evaporated again; and this is a third time repeated; then the Matter is Calcin'd for about half an Hour, which will turn it into a white Powder fit for use.

Mr. Poyle calls it *Bezoardicum Minerale*.

BEZOARDICUM or *Bezoarick Remedies*, or *Cordial*, are such as are endued with a Vertue to resist and expel Poison and Malignity.

BEZOARDICUM *Joviale*, is a *Regule* made by melting 3 Ounces of *Regule* of Antimony with 2 Ounces of *Block-Tin*, which being powdered is mixed with 6 Ounces of *Sublimate Corrosive*, and then is distilled off in a kind of Butter; which Butter is afterwards dissolved in Spirit of Nitre (of thrice its weight) and then the Solution is distilled three times. The *Bezoar* will remain at the bottom; which must be powdered and washed, and then mingled with Spirit of Wine, and digested till it grow insipid.

BEZOARDICUM *Lunale*, is made by mixing 8 Ounces of Rectify'd Butter of Antimony, with an Ounce of fine Silver, and then dissolved in Spirit of Nitre, which must be poured on gently fresh and fresh till all the Ebullitions are over, then the Spirit is drawn off from the Matter with a gentle Heat (with three Rectifications) and then the *Bezoar* is managed like the *Jovial Bezoar*: Which see.

BEZOARDICUM *Martiale*, is a Dissolution of *Crocus Martis* made by Reverberation (or at least as much of it as can be effected) in Butter of Antimony; and then Spirit of Nitre is poured on it, and they proceed as in the other *Bezoardick Preparations*.

BIBITORY *Muscle*, is by some said to be that *Muscle* that draws down the Eye towards the Cup when we drink.

BICEPS,

BICEPS, is a Muscle of the Cubit, so called because it hath two Heads or Beginnings ; the first, or outmost, arises with a long round Tendon from the upper part of the Brink of the *Acetabulum Scapulae*, and runs under the Ligament of the Articulation in a *Sulcus* or Channel on the Head of the Shoulder-bone, where it is inclosed by a proper Ligament. In its descent it begins to grow fleshy as it marcheth under the Termination of the Pectoral Muscle, where dilating it self into a large fleshy Body, in-joyns with its other Head or Beginning. The latter ariseth with a somewhat board, flat and long Tendon at the extremity of the *Processus Caracoides Scapulae* ; in its descent it strictly adheres to the *Coracobrachialis*, (wherefore some Authors not rightly describing that Muscle amongst those of the Arm, have mistaken it for a fleshy beginning of this.) But then parting from it, both these Heads compose a large fleshy Belly, which becoming Tendinous near the *Cubiti*, is commonly said to be inferted by a strong round Tendon to the Tubercle at the upper Head of the *Radius*. But we (says *Couper*) have observed this Tendon to be double, the External of which being thin, passeth obliquely over the *Musculus Pronator Radii Teres*, and Membrane-like expanding it self, joins with the *Membrana Communis Musculorum*, which embraceth all the External Muscles of the *Carpus* and Fingers : when this Muscle asteth the *Cubiti* is bended.

BICEPS, a Muscle of the Leg, called sometimes *Biceps Femoris*, to distinguish it from the *Biceps Cubiti*. It hath two Heads, the superior and longest of which ariseth with a round Tendon from the Protuberance of the *Ischium* ; in its descent it becomes large and fleshy, and in above half its Progress lessens it self again, where it is joined with its other Head, having a broad, partly Tendinous and partly Fleshy beginning from the *Linea Aspera* of the *Os Femoris*, immediately below the Termination of the *Gluteus Maximus* ; it being thus united, grows Tendinous, as it marcheth in a Channel on the External *Appendix* of the *Os Femoris*, becoming perfectly Tendinous at its Implantation to the Superior *Epiphysis* of the *Fibula*. Its use is to help bend the *Tibia* ; it is likewise employed in turning the Leg, together with the Foot and Toes, outwards, when we sit with the Knees bended.

BIGAMY, signifies, either, as formerly, those that were married more than once, which was then an Impediment that hindered a Man from being a Clerk ; or as used in Common-Law, to have more than one Wife at the same time.

BIGHT or *Bite*, is any turn or part of a Rope that lies compassing ; and therefore when they cannot take the End of a Rope in Hand, the Seamen say, give me a *Bite*.

BILANCHIS *Deferendus*, is a Writ directed to a Corporation, for the carrying of Weights to such a Haven, there to weigh the Wools that such a Man is Licensed to Transport.

BILANDER, see *Belandre*.

BILDGE, of a Ship, is the Bottom of her Floor, *Bildge Water* therefore is that which by reason of the Flatness of a Ship's Bottom lies on her Floor, and cannot go to the Well of the Pump ; and consequently the *Dutch*, whose Ships are often of this Form, do much use a sort of Pumps called *Bildge Pumps*, or as we call them *Burr-Pumps*, to carry off this *Bildge Water* : Also when a Ship strikes on a Rock, they say, *She is Bildged*. And *Billage*

is the Breadth of her Floor when she lies aground.

BILE, or the *Gall*, is a Liquor partly Sulphureous, and partly Saline, which is separated from the Blood of Animals in the Liver ; for the receiving and evacuating of which there have been reckoned only two Vessels or Passages, that is, the *Gall-bladder* and the *Porus Biliaris*. By this latter there flows a thicker but milder ; by the former a thinner, and more Acrimonious and Fermentative Choler into the Intestine. But besides these, there have been lately found out a Third, which we shall describe by and by.

The *Gall-bladder*, called in Greek *κυστις χοληδον*, in Latin *Vesica biliaria*, or *Folliculus fellis*, is a hollow Bag placed in the under or hollow Side of the Liver, and in Figure representeth a Pear. It is about two Inches in length, and one in breadth, where broadest.

By its upper Part it adheres to the Liver, which doth afford it a Hollowness to lodge in ; but the lower Part, which hangeth without the Liver, resteth upon the Right Side of the Stomach and the Colon, and doth often dye them both Yellow.

It hath three *Membranes*, one *Common*, which is thin and outmost. This springing from the Membrane of the Liver, only covereth that Part which hangeth without the Liver. The two other Membranes are *proper*. The middle is thick and strong, and muscular, and hath three Ranks of *Fibres* ; the outmost are transverse, the middle oblique, and the innermost straight. But some will allow only two Ranks, *viz.* the Straight, which run lengthways of it, and are outer ; and the Transverse or Annular, which are the inner.

The inmost Coat is Nervous, or Tendinous as it were ; and to the inside of this there adhereth a kind of Glandulous Coat. The Glands herein do separate from the Arteries a kind of Mucous Humour, which serves to defend the *Vesica* from being irritated by the Acrimony of the Choler contained in it.

Besides these two *proper* ones, *Verbeey* affirms there is a Third, betwixt that I called *common*, and the middle, and says, it is so evident, that he wonders this quick-sighted Age has not yet discover'd it. It is interwoven with whitish *Fibres* drawn diversely and irregularly, and has abundance of Nerves and Sanguiferous Vessels running thro' it, whose chief Branches run mostly from its Neck towards its Bottom ; and upon this Account this Coat may be termed *Vascular*. In fat People it contains much Fat, and with a little Labour is separated into divers Flakes (or Plates.)

It hath two *Parts*, the *Bottom* and the *Neck*.

The *Bottom* is its larger or wider Part that contains the Choler, and is of the same Colour with the Bile that is in it ; whence it commonly looks Yellow, but sometimes Greenish, Blackish, &c.

The *Neck* (otherwise called *Meatus Cysticus*) is its narrower Part, being but about as wide as a Goose-quill, and about two Inches long. Betwixt this and the *Vesica* there is a certain Fibrous Ring, which much straitens the Passage, and so hinders the two hasty Repletion of the *Vesica*. The other End of the Neck is joined to the *Porus Biliaris*, and they both make the *Ductus Communis* or common Passage of the Choler, which is inserted into the Beginning of the *Jejunum*, or the End of the *Duodenum*. *Peucernus* has observed, that in many

ny Birds, and some Fishes, this *Meatus* does not join the *Porus bilarius*, but is inserted separately into the Guts.

The Ancients (whose Opinion is of late stiffly defended by Dr. Cole) thought that the Choler in the Gall-bladder was received in by its Neck from the *Porus bilarius*, and that it passed out into the common Duct the same way. And to obviate the Objection, that there uses not to be a Reciproca-tion of Humours in the same Vessel (at the same time especially.) Dr. Cole supposes, that the Gall passes out of the Gall-bladder only in the time of the distribution of the Chyle, but at all other times it is received into it from the *Porus*, and is stored up in it against the next Occasion. But not to enter into this Dispute, I think Dr. Glisson's Account of it the more probable, which is this: The ordinary way of filling the Gall-bladder, is by its Fi-brous Roots that are dispersed thro' the Liver. The whole Trunk of these Roots enters that Part of the Bladder where 'tis strained by a Fibrous Ring. This Trunk indeed hardly equals the Hun-dredth Part of the Roots of the *Porus bilarius*; yet it distributes some Twigs and Capillary Vessels in-to the hollow Side of the Liver. But if you open the Gall-bladder with a Design to understand the Manner of the Insertion of this Trunk into it, truly you will not easily find it. For tho' this Duct do penetrate the said Bladder, and the Hu-mour contained in it be discharged thereinto; yet there is hardly any Print or Sign of this Hole in the Inside of the Bladder: Which ought not to seem hard to be believed by any one, if he re-member the Insertion of the Ureters into the *Vesica*; for tho' these do far exceed this Trunk in Width, yet one can hardly find their Insertion if he cut open the Bladder and look for it. The best way (that I could yet find) to discover the Inser-tion of this Trunk (if you will open the Gall-bladder, and search for its Entrance into it) is thus; look carefully for a certain little and spongy Pro-tuberance near the Orifice of the Bladder hard by the *Meatus Cysticus*; for the aforesaid Trunk, I think, is pretty plainly inserted into that Pro-tuberance.

This Protuberance is called a Valve by *Spigelius*.

Besides this Mr. Perault has found out another new Conduit for the Bile, which he calls *Ductus cyst-hepaticus*, because it is common both to the *Vesicula* and the *Porus Hepaticus* (or *Bilarius*.) This Duct has three Roots, which being subdivided into numerous Twigs, are dispersed thro' the Pa-renchyma of the Liver, amongst the Branches of the *Vena Cava* and *Porta*: These Roots grow into one Trunk, which creeping along the Surface of the hollow Side of the Liver, has a double Im-plantation; one into the *Porus Bilarius*, two Inches and an half before the said *Porus*'s, uniting with the *Meatus Cysticus*; and another into the middle of the *Vesica* (on that Side of it which adheres to the Liver) with a Valve. This Valve seems to be formed of the inner Membrane of the *Vesica*, and also a proper one, and may be said to be a kind of middle Valve, between the Nature of the *Sig-moides* and *Triglochin* (or *Triscapus*) of the *Vena Ar-teriosa* and *Arteria Venosa* in the Heart. Betwixt its Insertion into the *Porus Bilarius*, and this into the *Vesica*, there is about six Inches length. It contains a thinner Choler in it than the *Porus Bi-larius*.

Jo. Alph. Borallius (Professor of the Mathema-ticks at Naples) from the continual and speedy Ef-flux of the Bile by the *Ductus Communis* into the *Duodenum*, believes, that there is a particular Cir-culation of it: For he affirms, That in a Day's time, from a Person fasting, there pass thirty four Pound of Bilious Juice into the *Duodenum* by the common Duct, whereas the whole Mass of Gall is not two Pound: Whence he concludes, that so great a quantity of Gall cannot be produced in the Liver by way of Fermentation, but that it is separated Mechanically, without the help of any Ferment, only by *Cibration*, from the Minute Ves-sels of the *Porta* thro' the Pores of the Glandules of the Liver, as the Urine is separated in the Kid-neys; so he infers, that there is a particular Cir-culation of the *Bilis* thro' the *Abdomen*, performed by the *Vene Mesurice* into the Trunk of the *Porta*, thence to the Liver, thence thro' the Bilious Ves-sels into the *Duodenum*, to return again by the Me-sarack Veins. He that would enquire more into this Novel, and (to me) improbable Opinion, may consult his *Opus Posthumum (pars altera) de mo-tu Animalium*.

It has been taught by several Anatomists, That its Neck or *Meatus* has sometimes two, sometimes three *Valves*, to hinder the Recourse of the Cho-ler; but *Diemerbroeck* professes he could never find any, but only that the Egress of the *Vesica* was very strait, and its Neck wrinkled. Dr. Glisson de-clares also, That he has open'd very many Vessels of this kind, and never yet saw a Valve in any of them: But he thinks that the Fibrous Ring (a-bove-mention'd) did impose upon those who have thought there was a Valve. Besides, upon tryal he has often found, that the Bile by a light Com-pression of the Fingers, has fluctuated to and a-gain out of the *Cystis* into the *Meatus*, and on the contrary; as also out of the *Meatus* into the *Du-ctus Communis* and back again: Which certainly could not be, if there were any Valve in the way, for that would hinder the one or other of these Motions.

The *Vesica Fellea* hath two Veins called *Cystica Gemellæ*, which spring from the *Porta*. It hath Twigs of Arteries proceeding from the right Branch of the *Cœliaca*; and it hath a small thread-like Sprig of a Nerve from the Mesenterical Branch of the *Intercostal*.

Many times Stones are found in it, which are lighter and more spongy than those of the Uri-nary Bladder, and will swim above Water, which these latter will not do.

The other Passage which carrieth the thicker sort of Choler, is called *Porus Bilarius*, or *Meatus Hepaticus*, because it passes directly from the Liver to the *Ductus Communis*.

Within the Liver, its Trunk and Branches are invested with a double Coat; its proper one which it retains without the Liver also, and another that is common to it with the *Porta*, called *Capsula Com-munis*, which it has from the Membrane of the Liver. In this common Coat this *Porus* and the *Porta* are so closely enwrapped, that you would take them but for one Vessel, till you hold it ei-ther up to the Light (which will discover Vessels of two Colours in it) or very dexterously rip up the *Capsula*, and so lay them open. Its Roots within the Liver are equally divided with those of the *Porta* every where, saving that little Space where the Roots of the *Vesica* are spread in the

Sinuus

Sinuous and Right-side of the Liver. So that having spoken above of the Divisions of the Roots of the *Porta*, I shall only observe, that they are far larger and more numerous than those of the *Vesica*, drawing Choler from all the Parts of the Liver (saying whither the Roots of the Bladder reach) and that more thick and viscous, yet less Acrimonious.

This *Porus* seems to be a more necessary Part than the *Vesica*; for many Creatures, as Harts, Fallow Deer, the Sea-Calf, &c. and those which have a whole Hoof, as an Horse, &c. have no Gall-Bladder, but there is none that is destitute of this.

Without the Liver it is as wide again as the *Meatus Cysticus*, with which it is joined at two Inches distance from the Liver, and both make the *Ductus Communis Choleodochus*.

It has no *Valve* in its whole Progress; only the *Ductus Communis*, where it enters the Intestine, having pierc'd the outer Coat, passes betwixt that and the Middlemost about the twelfth Part of an Inch, and at last opens with a round Mouth into the Intestine. So that this oblique Insertion (as that of Ureter into the Urinary Bladder) serves instead of a *Valve* to hinder any thing from regurgitating out out of the Gut into this Duct, especially the inmost Tunicle of the Intestine hanging so flabby before its Mouth, that when any thing would enter in, it claps close upon it and stops it.

As to any *Angustomies* of the Roots of any of these Biliary Vessels, with those of the *Vena Porta*, such indeed have been much talk'd of, but without truth, for their extreme Twigs or Capillaries terminate in the *Parenchyma* of the Liver, out of whose Grape-stone-like Glandules they imbibe the Choler there separated from the Blood; as is the Case of the Capillaries of the *Cava*, for they receive the Blood it self imported by the *Porta*, in like manner, without any Inosculation.

The Use of all these *Vessels* may sufficiently be learned by what has already been said of them; though some are of Opinion, that not only Choler, but other superfluous Humours are evacuated by them, especially upon taking a Purge.

The Ancients lookt upon the *Bile* as a meer Excrement, or at least, to be of no other use than by its Acrimony to promote the Excretion of the Guts: Which Opinion continued as long as the Liver was thought to be the *Vas Sanguificans*. But when once that *Viscus* was discovered to have scarce any other Office, then to separate the Choler from the Blood, it hath seem'd unreasonable to suppose so large a Bowel was made only for the separation of a meer Excrement; and therefore its now generally believed, that the *Bile* is the proper Ferment for both the Chole and the Blood. A very good Account of the manner of which *Dionbroeck* gives us, as follows: The Blood flowing into the Liver by the *Porta*, out of the Gaffrick and Melarick Veins (and, it may be, a little by the Hepatick Artery) is mixed with an Acrimonious, Saltsiff, and Subacid Juice (made in the Spleen, of the Arterious Blood flowing thither by the Arteries, and of the Animal Spirits by the Nerves) which is brought into the *Porta* by the *Ramus Splenicus*. Now both these being entred the Liver by the Branches of the *Porta*, by means of this said Acrimonious and Acid Juice, and the Specifick Vertue or Coction of the Liver, the Spirituous Particles, both Sulphureous and Salt, lying

hid in the said Viscous Blood, are dissolved, attenuated, and become also a little Acrimonious and Fermenting; a certain thinest part whereof like most clear Water, being separated from the thicker Mafs of Blood, by means of the conglomerated Glands placed mostly in the hollow Side of the Liver, is carrid from thence by many Lympheducts, as has been said. But the Fermentaceous Spirits of greater Acrimony, mixed with the thicker and more viscid sulphureous Juices (for Sulphur is viscid) and more strongly boiled, when as through the Clamminess of the Juices in which they inhere, they cannot enter the conglobated Glands, nor from them the Lympheducts, and yet through their fierce Ebullition are separated from the Blood (as Yest from Beer) these Fermentaceous Spirits, I say, being sever'd with the Juice in which they inhere, become bitter, and are called *Bile*; which *Bile* being transcolated through the Grape-stone like Glandules in the Roots of the *Porus Biliaris*, and of the Gall-bladder, passes through them by the *Ductus Communis* into the *Duodenum* or *Jejunum*, where it is presently mixed with the Pancreatick Juice, and both of them with the Alimentary Mafs, concocted in the Stomach, and now passing down this way, which it causes to ferment. And because at its first Entrance it is more Acrimonious, and has its Vertue entire, and so causes the greatest Ebullition with the Pancreatick Juice; hence the Milky Juice contained in the Mafs concocted in the Stomach is more readily, and in greatest quantity separated in the *Jejunum*, and by innumerable Lacteal Vessels (which are more numerous in this than the other Guts) it is more quickly driven on towards the *Receptaculum Chyli*, and this is the Reason that this Gut is always so empty. But in the following Guts, because the Fermentaceous Spirits are a little pall'd, the Effervescency becomes slower and less efficacious, and the Chyle is more slowly separated from the thicker Mafs, and therefore they have fewer *Vena Lactea*. At length what remains of this fermenting Matter, is mixed with the thicker *Feces* in the great Guts, where by its Acrimony it irritates them to Excretion.

BILINGUIS (in Law) is that Jury which passes between an *Englishman* and an *Alien*; whereof part ought to be *Englishtmen*, and part *Strangers*; this is vulgarly called *Party-Jury*.

BILL, is all one with an *Obligation*, only when it is in English it is commonly called a *Bill*, in Latin an *Obligation*. Or a *Bill* is a single Bond without a Condition; and *Obligation* is a Bond with a Penalty and Condition. Also a Declaration in Writing, that expresses the Grievance and Wrong which the Complainant has suffered by the Party complained of; or else some Fault committed by him against some Law or Statute of the Realm.

BILL of Store, is a kind of Licence granted at the Custom-house to Merchants, to carry such Stores and Provisions as are necessary for their Voyages Custom-free.

BILL of Surreance, is a Licence granted at the Custom-house to a Merchant, to suffer him to Trade from one *English* Port to another, without paying Custom.

BILLA VERA (a Law Term) signifying the Indorment of the Grand Inquest upon any Presentment or Indictment which they find to be probably true.

BILLET, a Bearing very common in Heraldry of this Form. *Argent Billette* a Cross engrailed Gules, by the Name of Heath. 'Tis called here *Billette*, because the Billets are supposed to be all over the Field, but sometimes they are not above six, &c. and then they are numbered. *Gullim* faith, it represents a Letter folded up, and not a Billet of Wood. *Bloom* faith Billets must be numbered, if not above 10.

BIMEDIAL, a Term in Mathematicks, if two *Medial Lines*, as *AB* and *BC* commensurable only
 $A | \text{---} B \quad C | \text{---}$
 in Power, containing a Rational Rectangle, are compounded, the whole *AC* shall be irrational, and is called a *first Bimedial Line*, 38. e. 10. *Eucl.*

BINOCLE, is a kind of Dioptrick Telescope fitted so with two Tubes joining together in one, as that you may see a distant Object with both Eyes together.

BINOMIAL ROOT, in Mathematicks, is a Root composed of two Parts or Members, and no more, connected together by the Sign $+$: Thus $a + e$, or $5 + 3$ is a *Binomial Root*, consisting of the Sum of those two Quantities; If it have three Parts, as $a + b + c$, 'tis called a *Trinomial*, &c. if it have four Members, 'tis called a *Quadrinomial*, &c.

BIOLYCHNIUM, is what some call the *Vital Flame*, or Life of Animals. See *Flamma Vitalis*.

BIOVAC, in War, is a Guard at Night performed by the whole Army; which either at a Siege or lying before an Enemy, every Evening draws out from its Tents or Huts, and continues all Night in Arms before its Lines or Camp to prevent any Surprise. When the Troops are much harassed, or there is no great dread of the Enemy, the *Biovac* is allowed to be sufficient if the two Front Ranks by turns stand under Arms, while the Rear Ranks rest on the Ground. To raise the *Biovac*, is to return the Army to their Tents or Huts at break of Day.

BIPARTITION, the same with *Bissection*, or dividing a thing into two equal Parts.

BIQUINTILE, an Aspect of the Planets, when they are 144 Degrees distant from each other.

BIRTH or *Birthing*; the Seamen call a due or proper distance observed between Ships lying at an Anchor or under Sail a *Birth*; and so also they do the raising or bringing up the Sides of a Ship. Also the proper Place aboard for a Mess to put their Chests, &c. is called the Birth of that Mess. Also a convenient Place to Moor a Ship in, is called a *Birth*.

BISUTH, or *Tin Glass*, by the Ancients was thought to be a natural Marcasite or Mineral; but *Lemmy* faith, 'tis a kind of *Regulus* or Tin, and assures us, that good Bismuth may be made with *Tin*, *Tartar* and *Salt Peter*; and some mix *Arsenick* also with it, for which Reason it ought not to be taken inwardly. Its Flowers and Magistery are used as Cosmetics; and the *Pewterers* also do use Bismuth to render their Work more Beautiful, and to make the Metal ring the better.

BISSECTION, a Term in Geometry, signifying the Division of any Quantity into two equal Parts or Halves; the same with *Bi-partition*: Thus

to bisect any Line, is to divide it into two equal Parts.

BISSEXTILE, the same in *Chronology* as our Leap-Year; and the Reason of the Name is because in every 4th Year they accounted the 6th Day of the Kalends of March twice; for once in four Years, the odd Hours (above 365 Days) made up just an whole Day, which was inserted into the *Calendar* next after the 24th of February.

BITE, in the Sea-Phrase, is the compassing or bringing about of a Rope or Cable; the Seamen call holding by that Part of a Rope which is quilled or rowled up, *holding by the Bite*.

BITTACLE, is a Fram of Timber standing in the Steerage of a Ship just before him that Steereth, and in it is placed the *Compass*, by which the Ship is kept in her Course, and finds her way.

BITTER, any Turn of a Cable about the Bitts is called a *Bitter*; and 'tis used that the Cable may be let out by little and little. And when a Ship is so stop'd by a Cable, they say she is *brought up to a Bitter*. Also that End of the Cable which is used to be wound or belayed about the Bitts, they call the *Bitter End of the Cable*.

BITTS (aboard a Ship) are two great Pieces of Timber, on, or through whom goeth the *Cross Piece*, placed usually abaft the *Manger* in the *Loof* of the Ship, to *belay* (or fasten) the Cable thereto when she is at Anchor: Their lower Ends are fastened into the *Riders*; and in great Ships their middle Parts are bolted to two great Beams cross the *Bows*; and yet in great Storms they are fain to fasten the Cable to the Main Mast, to strengthen the Bitts, and to secure the Bows, which are sometimes else torn from the Ships.

There are *Fore Top-sail Shear Bitts*, whose use is to *belay* or fasten the *Fore Top-sail Sheats*.

And there are also the *Fore-jeer Bitts*, which serve to *belay* or fasten the *Fore-jeer*.

BIVALVE, is a Word used by the Writers of Natural History for both such Shell-Fishes as have two Shells, as Cockles, Muscles, Oysters, &c. which are said to be of the *Bivalve* kind; and also for the *Siliqua* or Seed-Pods of such Plants as open all their whole Length to discharge their Seeds, such as Beans, Pease, &c. for those the Botanists say have a *Bivalve Siliqua*.

BIVENTER: See *Digastricus*.

BLACKMAIL, signifies a certain Sum of Money, (or rather only of) Corn, Cattel, &c. given by the Poor People in the North of England, to the most powerful Persons in those Parts, or in the Hundreds, for a Protection against Thieves and Robbers.

BLAKNESS, the Colour so called, seems to arise from such a peculiar Texture and Scituation of the Superficial Parts of any black Body, that it doth as it were dead the Light falling upon it, and reflect none, or very little of it, outwards to the Eye. See *Colour*, and Vol. II.

BLACK-ROD, is the *Huisfier* or Usher belonging to the most Noble Order of the Garter; so called from his *Black-Rod* which he carries in his Hand: He is also of the King's Chamber, and Usher of the Lord's House in Parliament.

BLADDER, see *Vesica*.

BLASS, a Word used by *Van Helmont*, as *Blanchard* faith, to signify the Motion of the Stars, &c.

BLAZONING, in Heraldry, is displaying or expressing the Parts of a Coat of Arms in their proper

proper Colours and Metals; for to lay Colour on Colour, or Metal on Metal is false Heraldry.

In Blazoning a Coat of Arms, you must always begin with the Field, and then next proceed to the Charge; and if there are many things born in the Field, you must name first that which is immediately lying upon the Field. Your Words must be very short, and truly proper and expressive, without any Expletives, needless Particles, or Repetitions. In the Blazon of a Coat of Arms, such Terms for the Colours must be used as are agreeable to the Station and Quality of the Bearer: All Persons beneath the Degree of a Noble, must have their Coats blazoned by Colours and Metals; Noblemen by precious Stones; and Kings and Princes by Planets.

BLENCH, (in Law) is the Title of a kind of Tenure of Land; as to hold Land in *Blench*, is by Payment of a Sugar-Loaf, a Bever Hat, a couple of Capons, and such like; if it be demanded in the Name of *Blench*, i. e. *nomine Alba firmæ*. See *Alba firma*.

BLINDS, in Fortification, are certain Pieces of Wood, Branches of Trees laid across from one Side of the Trench to the other, to sustain the *Bavins* or Hurdles laden with Earth; and serve to cover the Pioneers from above, and are commonly used when the Works are carried on towards the *Glacis*, and when the Trench is extended in Front toward the Place.

BLISTERING Plasters, see *Vesicatoria*.

BLOCKADE, in the Art Military, is the encompassing any Town or Place so all round with Armed Troops, that 'tis impossible any kind of Supplies can be brought to it, and so it must be starved or surrender; but there is no Design of taking it by Attack, &c. And when any Place is in this Condition, 'tis said to be *Blocked*.

BLOCKADING, is when the Besiegers take Care to stop all Ways and Passages, and all Intelligence that may be sent into or out of the Town or Fort that is block'd up, but the Place is not regularly besieged, nor attack'd in Form.

BLOCKS, are the Pieces of Wood aboard a Ship in which the Shivers are placed, and wherein go the running Ropes. Of these Blocks some are single, some double, and some have 3, 4 or 5 Shivers in them. They are distinguished and named by the Ropes they carry, and the Uses they serve for. When in the Haling of any Tackle or Halliard to which there do belong two Blocks, they happen to meet, then they cry *Block and Block*.

BLOOD: In *Phil. Transact.* N. 191, is an Estimate of the Quantity of the Blood in a Human Body, and of the Celerity of its Motion by Dr. *Allen Moulin*.

Dr. *Lower* was probably mistaken when he computed the Quantity of Blood in an Ordinary Man to be about 20 Pounds; and the Computation of Dr. *Moulin*, That the Blood is about $\frac{1}{3}$ of the Weight of the whole Animal, seems much rather to the Truth; for then an ordinary Man may be supposed to have about 8 or 10 Pounds of Blood in him.

Of the Circulation of the Blood, Dr. *Gilson* gives this Account.

Seeing by a continual Reciprocation of the Pulse there is a constant Expulsion of Blood from the Heart into the Arteries, and as continual an Influx of Blood into it out of the *Cava*; and seeing the *Cava* from whence the Supply is, is never dry;

nor, on the other Hand, the Arteries that receive the Blood continually from the Heart, unduly swell'd with it; it necessarily follows, that this Motion proceeds circularly, viz. that the Blood is continually driven out of the Heart into the Arteries out of these into the Parts to be nourished; from whence it is resorbed by the Capillary Veins, which conduct it back through the larger into the *Cava*, and so at length it returns to the Heart again. The Invention of which Circulation is owing to our Country-man Dr. *Harvey*, and may be proved undeniably by these Reasons.

1. From the great quantity of Blood that is driven out of the Heart into the Arteries at every Pulse. For though the Ancients who knew not this Circulation, imagined that only a drop or two was expelled by every *Systole*, which they were necessitated to suppose, to avoid the great Diffention that the Arteries must be liable to, if any considerable Quantity issued into them; yet it is certain and demonstrable, that there must needs an Ounce or more be driven into them each time. For (taking it for granted that there is no other way for any Liquor to pass from the Stomach to the Kidneys, but through the Heart along with the Blood) seeing, if some Men at some times drink three Pints of Drink, they shall piss it out again in half a Hour, yea more of *Tunbridge* Waters in that space; and seeing, secondly, that there is commonly as much Blood as Serum that flows to the Kidneys (the Blood returning back by the emulgent Veins) it is clear, that by the two Emulgent (which are none of the largest Arteries) there must pass in Half an Hour's time six Pound of Liquor, all which must come from the Heart; and how much more then may we conceive to be driven through all the other Arteries that run through the whole Body? This is more accurately evinced by Dr. *Lower's* Experiment, which is this: I cut asunder (says he) both the *Cervical* Arteries in a large Dog, and at the same time through an Hole made in the Left Side of his Breast over-against the Heart, I comprès'd the Trunk of the *Aorta* below the Heart, with my Finger, to hinder any Blood from descending by it; and lastly, I took Care also to straiten the *Brachial Arteries* under the *Axillæ*, by which Means almost all the Blood was driven out of the Heart through the *Cervicals*, (besides that which was sent into the *Vertebrales*) and which is wonderful to be related, within the 20th Part of an Hour the whole Mass issued out; so that it is not to be denied but that it all pass through the Heart in that space. And though it may be granted, that amidst such Wounds and Tortures the Heart does beat somewhat quicker than at other times; yet the same thing is partly evident from the Wounds in the Limbs when some notable Artery is cut asunder; for it is strange in how small a time a Man will bleed to death, even at that one Artery. Yea, we may give a great guess how much Blood is sent out at every Pulse, even from the ordinary opening of one Vein in the Arm, from whence a notable quantity of Blood will issue in a short time; how much may we then suppose will flow out of all the Veins, if they were opened at one time? Seeing then 'tis evident, that so great a quantity of Blood is expelled out of the Heart at every *Systole*, and that for all that the Arteries are not unduly distended, nor any Part swell'd by it neither, and yet the *Cava* and other Veins emptied, 'tis certain that the Blood that's driven

driven into the Arteries flows back to the Heart by the Veins in a constant Circulation.

2. A second Argument to prove it, may be taken from the Valves in the Veins, which are so framed that Blood may freely flow through them out of the lesser Veins into the greater (and so into the Cava) but not, on the contrary, out of the greater into the less. Yea, if one blow into the Cava through a Pipe, there will no Wind pass into the smaller Veins; but on the contrary, if you blow up the lesser Veins, the Wind will readily pass to the larger, and so to the Cava.

3. And lastly, the same thing is more clear by the Ligature in Blood-letting: For whether you let Blood in the Arm or Foot, you always tie the Fillet above where you intend to make the Orifice, and then the Vein below the Ligature will presently fill and grow tumid, but above it will fall and almost disappear. Which must needs be from hence, for that the Blood being driven along the Arteries towards the extrem Parts, returns by the Veins and ascends upwards, which coming to the Ligature, and being stop'd there, swells the Vein below the Ligature, and spurts out as soon as the Orifice is made; but when the Fillet is loosed again, the Blood flows no longer out thereat, but holds on its wonted Chanel in the Vein, and the Orifice closes up again.

Having sufficiently demonstrated the Circulation of the Blood, we will shew two things farther; *First*, How the Blood passes out of the Arteries into the Veins; and *Secondly*, in how long time the whole Mass of Blood may be supposed to pass through the Heart in its ordinary Circulation.

As to the *First*, it was the Opinions of *Riolanus*, That the Blood circulated only through the larger Vessels by Anastomosis or Inosculation of the Veins with the Arteries; and that that which run into the smaller, was all spent on the Nutrition of the Parts. But it is clear, that there must be a Circulation even in the smallest, from the great Quantity of Blood that will flow out of the least Artery in the Hand or Foot when it is cut, which is very absurd to imagine to be all spent on the Nourishment of the respective Part. Now there are but two Ways whereby the Blood can be supposed to pass out of the Arteries into the Veins, *viz.* either by the Former's being continued to or opening into the latter by Inosculation, or else by the Capillary Arteries letting out their Blood into the Pores of the Substance of the Parts, on whose Nutrition part is spent, and the remainder imbibed by the gaping Mouths of the Capillary Veins. That it is necessary to admit of this latter Way, is evident, because if part of the Arterial Blood did not issue into the Substance of the Parts, they could not be nourished by it; for while it is in the Vessels, it may and Warmth issued to the Parts through which it flows, but cannot nourish them, seeing even the Vessels themselves are not nourished by that Stream of Blood that glides along their Cavity, but by Capillaries running through their Coats; and if the Blood be driven into the Substance of the Parts, and that in a greater Quantity than suffices for their Nourishment (as was just now shewn that it is) what is superfluous must needs enter the Mouths of the Capillary Veins, from whence it goes forward to the larger, and so to the Heart: But seeing this way of transfusing the Blood thro' the Substance of the Parts, has seemed to some not to answer to that hasty Circulation of it we

have demonstrated; they have thought it necessary also to admit of the former way, namely, Anastomoses, by which the Veins are continued to the Arteries, and that not only in their larger Branches (as that notable one of the Splenick Artery with the Splenick Vein) but also in their smaller Twigs in the extrem Parts. But we must consider, that in a living Body the solid Parts are infinitely more porous and permeable than in a dead; so that tho' the Anatomists find their Substance so dense and close as to make it seem almost impossible they should permit so quick a Passage to the Blood through them; yet he should rather believe it, than suppose such Anastomoses as he cannot discover (though it were not difficult to find them out if they had any existence.) For abating that single one of the Splenick Artery with the *Ramus Splenicus* of the *Porta*, and perhaps some of the *Arteria* with the *Vena Pulmonarie* is the Lungs, none of the latest most accurate Anatomists have been able to find out any. And as for that mentioned, it seems rather to be of an Artery with an Artery (such as are frequent in several Parts of the Body, as are also of one Vein with another) than of an Artery with a Vein.

And *Secondly*, as to the Space of Time in which the whole Mass of Blood may ordinarily circulate through the Heart, it is probably much shorter than many have imagined; for supposing that the Heart makes two thousand Pulses an Hour (which is the least Number any speak of, and some have told twice as many) and that at every Pulse there is expelled an Ounce of Blood (which we may well suppose, seeing the Ventricles are wide enough to contain two Ounces, and that it is probable both that they are filled near full in the *Diastole*, and that they are near, if not quite emptied by the strong Constriction of the Heart in the *Systole*) seeing the whole Mass usually exceeds not four and twenty Pound, it will be circulated six or seven times over through the Heart in the space of an Hour. And by so much the oftner, by how much the Blood come short of the supposed Quantity, or the Pulse either naturally, or by a Fever, Spirituous Liquors, or violent Motion, is rendered more frequent; by which quick Motion the Blood itself is kept from Coagulation and Putrefaction, and the Parts are cherished with vital Heat, which Heat of the Parts is much according to the Slowness or Rapidity of the Circulation, So when we sit still, and the Pulse is slow or rare, we grow cold; but when upon running or any violent Exercise, the Pulse becomes more frequent and quick, we become hot.

As to the manner how Blood is made of Chyle, and of its Heat and Colour, and whether the Body be nourished by it, the aforesaid Dr. gives the following Account.

According to Dr. *Harvey's* Observations, there appears in an *Embryo* a *punctum saliens*, or red beating speck, which is Blood, before any the least Lineament of the Heart; so that whatever Instrument of Sanguification the Heart may appear to be afterwards, it, contribute nothing to the making of the first Blood; but it seems rather to be made for the Blood's sake, to transmit it to all the Parts of the *Embryo* or *Fetus*, then the Blood to be made by it. But it must be confessed, that things proceed in the grown *Fetus* far otherwise than they do in the first formation: For the Parts of an *Embryo* are nourished and increased before it hath a Stomach to concoct any thing, and yet in a perfect *Fetus*,
none

none can deny, that the Stomach does concoct and prepare Nourishment for it: So it moves before the Brain is formed to perfectly as to be able to elaborate Animal Spirits; and yet after it is perfected, every one knows that the Brain does elaborate such Spirits, as being sent into all the Parts of the Body by the Nerves, enables them to move. In like manner, though there be Blood in the Embryo before the Heart be formed, yet after it be perfected, nothing will hinder but it may at least contribute to Sanguination.

We will suppose then, that as all the other Parts are formed by the *Vita Plastica* or generative faculty of the (first) Vegetative and (then) Animal Soul, seated in the *Ovum*, and receive their first encrease by the Assimilation of the *Colligamentum*; but as soon as they are perfected, and the *Fetus* excluded, are nourished by the Blood; so the Blood it self as being at first made in like manner, as soon as the Veins, Heart and Arteries are completed so as it cannot circulate by them, may not improperly be said to be nourished by the Chyle or Nutritious Juice, the Heart assisting the Assimilation of the one into the other. And this is done in this manner: The Chyle ascending by the *Ductus Thoracicus*, and flowing into the Subclavian Vein together with the returning Venal Blood, is poured by the *Vena Cava* into the right Auricle, and so into the right Ventricle of the Heart in its *Diastole* or Relaxation; then by its *Systole* or Contraction it is driven out from thence into the Lungs, from whence it ascends again into the left Auricle first, and then into the left Ventricle of the Heart, out of which it is expelled through the *Aorta*, and passing along with the Blood through the Arteries of the whole Body, returns again with it by the Veins to the Heart. For it undergoes many Circulations before it can be assimilated to the Blood: Which is evident, both because it is the Chyle (but little altered) that is separated in the *Placenta Uteri* for the nourishment of the *Fetus*, and in the Breasts for the Infant to suck, in the form of milk; and also from hence, that if one be let Blood four or five Hours (or later) after a full Meal, there will a great quantity of the milky Chyle it self swim a top of the coagulated Blood. But every time the new infused Chyle passes through the Heart with the Blood, the Particles of the one or more intimately mixed with those of the other in its Ventricles, and the Vital Spirit and other active Principles of the Blood work upon the Chyle; which being full of Salt, Sulphur and Spirit, as soon as its *Compages* is loosened by its Fermentation with the Blood in the Ventricle of the Heart (especially, but also in the Arteries) the Principles having obtained the liberty of Motion do readily associate themselves, and are assimilated with such parts of the Blood as are of a like and suitable nature; so that at length all the Mass of Chyle that is capable of being turned into Blood is sanguified; and what is not, is evacuated by Urine or Stool, or other proper Emunctory.

It is a very difficult Question, by what means the Blood acquires its Heat: In order to the Resolution whereof, it will be necessary to consider how many ways a *Liquid Body* is capable of being heated, and those (according to Dr. Willis) are three: First, by setting it to something that is hot; so Water is made hot by being set on the Fire, or in the Sun, or a Stove, or by dissolving Lime in it. Secondly, When Saline Corrosives, which are of a contrary

nature, being mixt with one another, or with Sulphureous, act one upon another, and by the great struggling, and agitation of their Particles do often excite heat, yea sometime Smoke and Burning; as when Spirit and Butter of Antimony, or when *Aque Stigia* and Oyl of Turpentine are mixt together; as also when Corrosive Liquors eat into Metallick Bodies, they often grow hot. Thirdly, (which is the only way besides that a Liquid grows hot) when some Humour abounding with Sulphur or much Spirit; is set on Fire by holding a Flame to it, and so grows hot by Deflagration, as Brandy, &c. There are other ways indeed of Calcification, as Fermentation, Putrefaction and Attrition, whereby thicker or solid Bodies often grow hot, but in Liquid they produce no such effect. Thus Leven becomes (somewhat) hot by Fermentation, and Dung or wet Hay by Putrefaction; but neither way will a Liquid Body wax hot: For though Wine, Cyder, &c. ferment so much as to burst the Sides of the Hog-shead, yet they are not actually hot; nor will Blood become so, when it is let out of the Body, dispose it how you will in fit Glasses to ferment or putrefie. Indeed the Blood within the Body is fermented, and is thereby deperated, but it is not heated by such Fermentation, as neither is any other Liquid. Neither does the heating by Attrition agree to it; for though solid Bodies are heated by being rubb'd one against another; yet shake and agitate Liquids as much as you will, they shall be never the warmer for it. Therefore there are only those three ways first mentioned whereby actual Heat can be produced in any Liquid, let us see to which of them the Incalcescence of the Blood ought to be ascribed.

First, Both the Ancients and most Moderns are of Opinion, that the Blood is heated the first way, viz. by the admotion of something that is hot. Thus the former hath taught that the *Innate Heat* and the latter, that the *Vital Flame* is lodged in the Heart, and heats the Blood as it passes through it: But both these Opinions fall to the Ground, since it is clear, that the Heart is a *clear Muscle*, and contains no fit Fuel for perpetuating a Flame, or I know not what implanted Heat: For though it must be acknowledged, that the Circulation of the Blood depends on the continual Motion of this Bowel, yet the Heart derives it Heat wholly from the Blood, and not the Blood its Heat from the Heart.

Secondly, This Heat cannot be caused in the Blood the second way, because its Liquor in a Natural State is always Homogeneous; and tho' it abound with Salt, yet that is only Volatile, Mild, and Benign. Nor can any one discover either in the Heart, or in any other Place, a Saline or otherwise Heterogeneous Mineral, by acting whereupon, or corroding whereof, the Sanguineous Liquor should conceive Heat.

Thirdly, As to the third way, whereby Liquids grow hot, though it seem an hard saying, that the Blood is accended; yet seeing we can attribute its Incalcescence to no other cause, why should we not impute it to this? especially seeing the proper passions of Fire and Flame agree to the Life of the Blood.

For the chief and most essential requisites to continue a Flame, are these three; First, That a free and continual access of Air be granted to it as soon as it is kindled; Secondly, That it enjoy a constant Sulphureous Pabulum or Fuel; and Thirdly, that it be ventilated, whereby as well its fuliginous, as thicker Recrements may be continually amended

from it; And seeing these agree to the *Vital Flame* as well as to the *Elementary*, it seems very rational to affirm, that *Life is self is a kind of Flame*.

Thus far that Learned Author, whom the Latin Reader will do well to consult, discoursing farther on this Subject, in his *Exercit. Medicophysica de Sang. incallescencia five accensione*.

Dr. *Henshaw* thinks that the dissimilitude of Parts between the Chyle and Blood is so great, that it becomes immediately the cause of an extraordinary Ebullition upon their mixture together; which is very much encreased by the Reciprocal Motion of the Lungs, whereby the Blood is wrought almost into a Froth or Foam by that time it gets into the left Ventricle of the Heart. Which sudden excess of Heat, is not unlike what happens upon the mingling several Chymical Liquors together, as Spirit of Wine, and Spirit of Turpentine, and other such like, where the Heat becomes so great, that it often endangers the Vessels they are contained in. He affirms (contrary to Dr. *Willis*, and I think to the Truth) that new Wine or Must, while it ferments, is hot, and that if the Juice newly pressed out of the Grapes were added to it as it begins to cool, it would again renew its Ebullition, and its Warmth would be continued so long, as one should persist to do so: In like manner he thinks it is the Warmth in the Blood continued by the new Affusion of Chyle, which renews its Fermentation, and consequently invigorates its Heat.

Diemerbroeck is of Opinion, That the *Vital Spirit* (by which he understands the most subtile part of the Blood) while through its great Volatility it always endeavours to fly away, does continually agitate the other thicker Particles of the Blood, with which it is intangled and detained from flight, and is diversly vibrated by them, and beat back; and so the whole Mass being kept in a continual fermentative Motion, there is produced in it an Heat, which in a great Agitation is great, and in a mean, mean; and in a small, small.

I might cite other Opinions concerning the reason of this Heat, but they generally fall it with some of those mention'd; of which I shall not make my self an Umpire, but think that Dr. *Willis* has said enough in his above-cited *Exercitation*, to evince that it is not caused either of these latter ways, viz. by Fermentation, or by Agitation of the Particles of the Blood in the manner *Diemerbroeck* describes it; and whether the accension of the Blood be the more probable reason of it, let the Reader Judge.

Why the Blood should be of a red Colour rather than any other, no satisfactory reason (I think can be given, but the Will of the Creator, though some attribute it to the Heart, others to the mixture of Salt and Subacid Juices with Sulphureous, because from such a Mixture there results a Red Colour, as appears in the Distillation of *Sal Nitre*, (which contains many Sulphureous Particles in it,) or by the pouring Oyl of Vitrol upon Conserve of Roses, or other thing that is of a palish Red (if it contain any thing of Sulphur) for it will be thereby made of a most deep Red. We will not spend time to shew in how many Respects these Instances differ from the *Phenomenon* under Consideration, but shall content our selves with inquiring from whence the Difference of Colour arises between the Venal and Arterial Blood. Every one knows that when Blood is let out of a Vein into a Porringer, the *Coagulum* is of a florid Scarlet Colour in its Surface,

but of a dark Red from the Superficies to the Bottom, and of such a Colour it appears as it streams out of the Orifice of the Vein. But if an Artery be cut, the Stream then looks of a far brighter Colour, like the Superficies of the Venal Blood when it is coagulated in a Porringer. Now the Arterial Blood receives not this florid Colour in the Heart, but in the Lungs. For if it received it in the Heart then might the Right Ventricle be supposed to give it as well as the Left; but that it does not do so, is clear by this Experiment of Dr. *Lower's*. If you open the *Vena Arteriosa* which receives the Blood out of the Right Ventricle, the Blood differs nothing in Colour from the Venal, but its cruddled part looks every whit as black. But if one open the *Arteria Venosa* as it is entering into the Left Ventricle, it has the perfect Colour of Arterial Blood, which shews, that as it owes not that Colour to the Left Ventricle any more than to the Right (being not yet arrived at it) so it must receive that Alteration of Colour in the Lungs, in which the Nitrous Air being diffused through all the Particles of the Blood, is intimately mix'd with it, and (if you will) accends it. For if there be any such thing as a *Flamma Vitalis* (properly so called) in Animals, though the Blood (or Chyle rather) be to it instead of the Oil or other Matter whereon it feeds, yet it oweth the continuance of its burning to the Air, without the continued Inspiration of which the Animal cannot live, but instantly dies, even as a Candle is presently extinguished, if you put it in a close Place where the Air cannot come to it, or by some Engine be suck'd from it. But this by the bye; for I must confess, that (how plausible soever this Opinion may seem on other Accounts) this Alteration of the Colour of the Blood by the Air in the Lungs, is no sufficient Argument to prove any such Vital Flame, seeing the Arterial Blood being extravasated, retains its florid Colour, when no doubt if ever there was any accension the Flame is extinguished. But this Scarlet Colour is owing merely to the Mixture of the Particles of the Air with the Blood in the Lungs, from which it transpires in a great measure through the Pores of the Skin, while the Blood circulates in the Habit of the Body, out of the Arteries into the Veins, whence the Venous Blood it self, when extravasated, appears of a Scarlet Dye in its Surface, which is merely from its being exposed to the Air; for if one turn the congealed Blood in a Porringer upside down, the Bottom, which at the turning is blackish, will in a little while turn to a lighter Red.

Though we have confessed, that the Chyle does circulate through the Body several times before it be perfectly assimilated to the Blood; yet we do not think that it passes into the Nourishment of the Parts in the Form of Chyle. And therefore when speaking of the Nutrition of the *Fetus* in the Womb, we often mention'd a *Nutritious Juice* (which was Chyle a little alter'd;) we did not call it so with respect to the solid Parts of the *Fetus*, but to the Blood it self, whose *Pabulum* or Nourishment it is, as soon as the Umbilical Vein is formed, as the Blood is of the Body. For as to the encrease of the first delineated Parts of an imperfect *Embryo*, that is far different from ordinary Nutrition.

The Blood then consisting of Particles of a different Nature, each particle passes into the Nourishment of that Part which is of the same Nature with it:

it: So the Salt and Sulphureous Particles being equally mix'd, are agglutinated and assimilated to the Fleſhy or Muſculous Parts; the Oily and Sulphureous to the Fat; the Salt and Tartareous to the Bones, &c. Now this is not done by any Election or Attraction of the Parts, as if they pick'd and chuſ'd (with a kind of Diſcretion) ſuch Particles of the Blood as are ſuitable to their own Nature, for the Maſs of Blood is equally and indifferently carried to all the Parts: But there is that diverſity of Figure both in the ſeveral Particles of the Blood, and in the Pores of each Part, that in the Circulation thro' the Habit of the Body, ſome ſtick in theſe, and others in thoſe, where they are faſten'd and united to the Subſtance of the reſpective Parts; and thoſe which thro' their peculiar Figure are unapt to adhere to one or other, return again to the Veins, and ſo to the Heart, where they receive ſome new Alteration: So that as *the Life of the Fleſh is in the Blood* (according to *Levit. 17. 11.*) ſo has it its vital Heat and Nouriſhment from it alſo.

BLOOD-WIT, is a Word uſed in Ancient Charters of Liberties, and ſignifies an Amerciament for ſhedding Blood; ſo that whoſoever had it given him in his Charter, had the Penalty due for ſhedding Blood granted him.

BLOODY-HAND, is the Apprehenſion of a Trefpaſſer in the Foreſt againſt Veniſon, with his Hands or other Part Bloody, tho' he be not found Chafing or Hunting. *Manwood*, Part 2. C. 18.

BLUFF-HEADED; a Ship is ſaid to be ſo, when ſhe hath but a ſmall Rake forward on, and that her Stern is ſet too ſtrait up.

BOCEHET, is a Deceit of any thing boil'd over again. *Blanchard*.

BOARD, a Word variously uſed at Sea: To go into a Ship is called *going a-board*; to be within the Ship, is ſaid to be *within Board*, and to be without the Ship, is ſaid to be *without Board*; when a thing is thrown into the Sea, they ſay it is *heaved over board*; when it ſlips down by the Ship's Side, they ſay it *ſlips by the Board*; when two Ships touch one another, they ſay they are *Board and Board*; that Side of the Ship that is to Windward, they call the *Weather-Board*; when a Ship lies up to Windward, ſometimes upon one Tack, and ſometimes upon another, they ſay *She makes a Board*, or *Boards it up*; and if ſhe advances much at one Turning or Tack, they ſay *She makes a good Board*; when they leave Land behind the Ship, they ſay they leave the Land on *Back-board*; to enter a Ship in a Fight, is called *Boarding of her*.

BOAT-ROPE, in a Ship, is that Rope by which the Ship tows her Boat at the Stern.

BOAT-SWAIN, or (as the Seamen call him) *Boorſon*, is an Officer a-board a Ship who hath Charge of all her Rigging, Ropes, Cables, Anchors, Sails, Flaggſ, Colours, Pendants, &c. He alſo takes Care of the Long-Boat and its Furniture, and ſteers her either by himſelf or his Mate. He calls out the ſeveral Gangs and Companies a-board to the due Execution of their Watches, Works and Spells; and he is alſo a kind of Provost Marſhal, ſees and puniſhes all Offenders that are ſentenced by the Captain or Court Marſhal of the whole Fleet.

BOCARDO, the fifth Mood of the third Figure in Logick, in which the Middlemoſt Propo-

ſition is an univerſal Affirmative, the firſt and laſt particular Negatives.

BLOCKLAND, was formerly that which we now call Free-hold Land, or Land held by Charters; and it was by that Name diſtinguiſhed from *Folk-land*, which was Copy-hold Land.

BODY; the Chymiſts uſually call that Veſſel which holds the Matter in Diſtillation of the Spirit of Vegetables a *Body*. 'Tis called alſo a *Cucurbiture*, where ſee its Figure.

BODY, in Geometry, is that which hath three Dimenſions, Length, Breadth and Thickneſs; as a Line is formed by the Motion of a Point, and a Superficies by the Motion of a Line, ſo a Body is formed by the Motion of a Superficies.

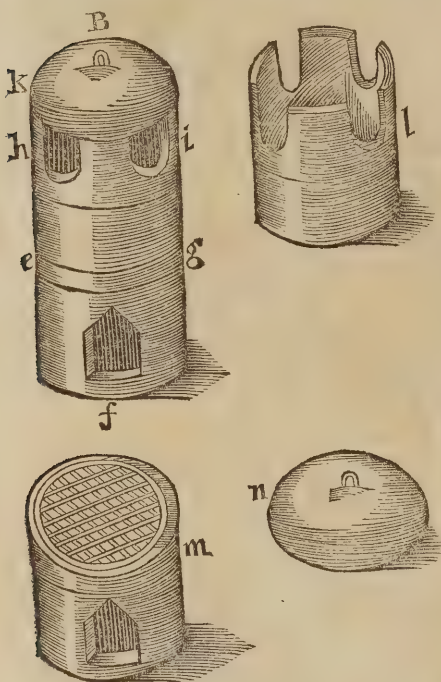
BODY, in Natural Philoſophy, is uſually defined to be a Subſtance impenetrably extended; or which having *Partes extra Partes*, cannot be in the ſame Place with, or penetrate the Dimenſions of any other Body. And this Property Sir *Iſaac Newton* expreſſes by the Word *Solidity*; and according to his excellent Philoſophy, the Idea of a Body is that which is *extended, ſolid and moveable*.

BODIES Regular, ſee *Regular Body*.

BOLONIAN Stone, is a ſmall, grey, weighty, ſoft, ſulphureous Stone, about the bigneſs of a large Walnut, and being broken, hath a kind of Chryſtal or Sparry Talk within it. It is found about *Bolonia* in *Italy* (whence its Name) and in many other Parts of the ſame Country, and in great quantity at the Foot of Mount *Palermo*; where a Shoemaker, one *Vimenzo Coſciarolo*, gathering up theſe Stones, carried ſome of them home and calcined them, hoping to extract ſome Silver out of them; but inſtead of his Aim, he diſcovered this ſtrange *Phenomenon*, that the Stone, when expoſed to Light, would retain it, and afterwards ſhine in the Dark. After this, tho' the Stone was much celebrated for its ſhining Quality, yet the Manner of preparing it, to exhibit this *Phenomenon* was not truly and fully known or diſcovered to the World, till one Mr. *Homborg* a German Phyſician, living at *Paris*, took the Matter into freſh Conſideration, and made a Journey into *Italy* to enquire about the Stone, and its manner of Calcination; and 'tis he that hath given us the following Proceſs to prepare it; which *Lemmy* in the laſt Edition of his *Chymiſtry*, P. 707. puts down to this Effect.

Take ſeven or eight *Bolonian Stones*, and raſp off all their Coat or Heterogeneous Earth about them till the Stone begins to glifter and ſhine; then powder one of them in a Brazen Mortar, (which Circumference is of abſolute neceſſity, for elſe the Stone will not ſhine) and ſift the Powder finely, and moiſtening the other ſeven with clear Brandy very well, roll them up and down in the Powder till their Surface be all covered with it. Then having provided a ſmall Furnace of Earth, round, and about a Foot high, beſides the Dome, and near a Foot and half in Diameter; the Aſh-room muſt have two Doors to give the Fire the more Air, one of them right againſt the other; the Hearth need have none, but only three or four hollow Cuts or Notches (as in the Figure) the Dome ſet on it for Reverberating the Fire on the Matter; the Grate ought to be of fine Braſs or yellow Copper, which helps to render the Stone Luminous, and the Holes in it muſt be ſmall.

B, the Furnace all together, *l*, the Hearth of the Furnace separated from the Dome and Ash-room, that the Hollows or Notches may appear.



m, the Ash-room with the Brass Grate. *n*, the Dome by it self, with its Ring to take it on and off.

All things being thus ready, put into the Furnace five or six kindled Coals to heat it, and when they are half wasted, fill the Furnace up to the Holes or Notches with small Cinders, and then lay your Stones covered with the Powder upon them; then cover them with other Cinders that the Furnace may be full: Lastly, fix on the Dome, and without touching it any more, let the Coals and Cinders burn to Ashes. When the Furnace is half cold, separate the Dome, the Hearth, and Ash-room, and you will find on the Grate the Stones calcined: Lay the Grate softly on white Paper, and gathering up the Stones carefully keep them in a Box with Cotton.

If these Stones be exposed to the Light in the open Air, as in one's Hand out of a Window, &c. (but not to the Sun-beams) for about a Minute, and then carried into a dark Place, they will for some time appear like kindled Coals, tho' without any sensible Heat; the Light will abate by little and little, but may be recovered anew, by the Stones being again exposed to the Light of the Day, as before. This surprizing Quality, if well used, they will retain for 2, 3, or 4 Years; and when 'tis lost, it may in part be recovered again by a new Calcination after the same manner.

If you draw any Figures on Paper with the White of an Egg, and while they are wet, strew on them the Crust of this calcined Stone powdered; then dry them in the Shade, put them in a Frame, and cover them with a Glass: They be-

ing exposed to the Light with the Glass Cover on, will at any time shine if removed into a dark Place.

BOLT-HEAD, *vid. Matrass*.

BOLT-ROPE, is that Rope into which the Sail of a Ship is fixed or made fast.

BOLTS, in a Ship, are Iron Pins, of which there are these several sorts; 1. *Ring-Bolts*, which serve for the bringing to of the Planks, and those Parts whereto are fastned the Breeches and Tackles of the Ordnance. 2. *Drive-Bolts*, and these are used to drive out other Bolts. 3. *Ser-Bolts*, which are employed for the forcing of the Planks and the other Works, and bringing them close one unto another. 4. *Rag-Bolts*, which are on each Side full of Jaggs or Barbs to keep them from flying out of the Holes wherein they are driven. 5. *Clench-Bolts*, which for the same End are clenched, that is, made fast at the Ends where they come thro'. 6. *Fore-Bolts*, which are made like Locks, with an Eye at each End, whereinto a Fore-lock of Iron is driven to prevent starting out. 7. *Fender-Bolts*, made with long and thick Heads, and are struck into the uttermost *Bends* or *Wales* of a Ship to save her Sides from Bruises and Hurts; and thence take their Name.

BOLUS, in a Mineral Sense, is a kind of Earth, and which Dr. Grew supposes to be a Bed, as it were, the *Materia Prima* of Opacous Stones and Metals; into which he thinks those of the said *Bolus* are transmuted by being concerted with divers Salts and Sulphurs, which fly in upon them successively.

BOLUS, is a Medicine taken inwardly, of a Consistence something thicker than Honey, and the Quantity for one Dose is as much as may be conveniently taken at a Mouth-full.

BOMB-CHEST, is a kind of Chest, which being filled with Gun-powder and *Bombs* (according to the intended Execution) is placed under Ground to blow it up into the Air, together with those that stand upon it. These *Bomb-Chests* are frequently used to drive Enemies from a Post they lately seized, or whereof they are about to take Possession; and are set on fire by the Means of a Sand-dige fastened at one End.

BOMBS or *Granada-Shells*, are hollow Balls of Cast Iron, which are filled with whole Powder, and sometimes with Nails, Pieces of Iron, &c. along with it. Their use is to be shot (out of Mortar-pieces) into besieged Towns, to annoy the Garrison, fire Magazines, &c. The largest are about 15, and some 18 Inches in Diameter. From these Bombs, being used in the besieging of Towns, we say such a Place was *Bombarded*.

BON-GRACE (in a Ship) is a kind of Frame made of old Ropes or Junks of Cables, which, in those who sail into Cold Latitudes, are laid out at the Bows, Sterns and Sides of the Ships, to preserve them from being injured by the great Flakes of Ice.

BONA Notabilia, (in Law) is where a Man dies, having Goods to the Value of 5 Pounds, in divers Diocesses, then the Archbishop ought to grant Administration; and if any inferior Bishop do grant it, it is void.

BONA Patria, a Term in Law, signifying an Assize of Country-Men, or good Neighbours; sometimes called *Affisa bona Patria*, when twelve, or more, are chosen out of the Country to pass upon an Assize; and they are called *Juratores*, because

cause they swear judicially in presence of the Party.

BONES, of an Animal Body. A Bone is by Anatomists defined to be a similar Part, most dry, cold, hard, inflexible, void of Sense, and affording Stabiliment and Form to the whole Body.

The Integral or Constituent Parts of Bones are their *Periosteum* or investing Membrane, their *Substance*, *Pores*, *Marrow*, *Glands*, *Vessels*, &c. of which take the following short Account from Dr. *Haver's Osteologia*.

The *Periosteum* hath two Sorts or Series of Fibres, the under deriv'd from the *Dura Mater*, the upper from the Membrane of the Muscles that lies upon it; which Fibres lie one upon the other, but are not interwoven one with another.

The under Fibres run all parallel directly from one End of the Bone to the other, and are continued from one Bone to another by Means of the Ligaments that join them together in their Articulations, upon which they pass.

The outer hold the same Course with the Fibres of the Muscle from whence they are derived, sometimes straight, sometimes oblique, sometimes transverse, and when they have run so far as to make up their Part of the *Periosteum*, he thinks they are inserted into the Bone, and are succeeded by others from some other Muscles. Some of the Tendons of the Muscles also propagate Fibres to make some Part of the *Periosteum*; but others penetrating it, are immediately inserted into the Bone.

The inner Superficies of the *Periosteum* sticks as close to the Bone as if it were glued to it; and besides, the *Periosteum* has little *Fibrellæ* or Threads continued from it, that enter into the Substance of the Bone, which gives them (probably) some internal Sense.

The *Uses* he ascribes to it, are, 1. To be a Tegument to the Bones. 2. To convey Spirits into the Substance of the Bones for maintaining their Heat, for preserving their Sensibility, and to assist in the Work of their Accretion and Nutrition, by means of the Minute Fibres it emits into them. 3. To help to set Limits to the Growth and Extension of the Bones, as the Bark is sometimes observed so to bind young Trees, that it is necessary to open it before they can have the Liberty of thriving. 4. It is serviceable in the Conjunction of the Bones and their Epithyses (while these are Cartilaginous) also of the Bones which are joyned by Sutures or Harmony, and in the Connexion of the Bones and their Cartilages. 5. To join the Heads and Tendons of the Muscles fast to the Bones; namely, of such Tendons as do not penetrate it (as some do not.)

Having done with the *Periosteum*, he comes to the Substance of the Bones, which he describes after this manner. He says, they consist of *Lamellæ* or Plates lying one upon another, and these of small Strings or Fibres running lengthways of the Bones (like as we see in Whale-bone;) which Strings, though some of them run to the very Extremities of the Bones, and others approach near to them, do not terminate there, so as to have distinct Ends, but they are, where they may be thought to terminate, still continued, and run transversely, and as it were arched, that the Strings of one Side of the Bone proceed as to meet and be united to those that are propagated from the opposite; and this at both Extremities, that they are a Continuation, though not in the Figure, yet in

the Manner of a Ring; therefore they are not all of a length, but in every Plate they fall one shorter than another.

In several Bones the *Lamellæ* are disposed diversly: In those Bones which have a large Cavity, they are on every Side contiguous and closely united; but in those which have not any great Cavity, but are altogether spongy within: Many of the internal *Lamine* are placed at some Distance from one another in all their Length, having betwixt them a Cavernous Substance or small bony Cells; and so have also those Bones, which have a large Cavity, some of those lesser Cells at both their Extremities.

Next he comes to their *Pores*, and says, That in the Bones, whose Plates are Contiguous, there are *Pores* through and between the Plates, besides those which are made for the Passage of the Blood-Vessels; and these are of two sorts: The one penetrate the *Lamine*, and are transverse, looking from the Cavity to the external Superficies of the Bone. The second sort are formed between the Plates, which are Longitudinal and Straight, tending from one end of the Bone towards the other, and observing the Course of the Bony Strings. The first kind are formed not only in the first internal *Lamine*, but in every one, even to the outermost, though the nearer they are to the Cavity, the greater is the number of the Pores. And as they pass, they do not observe any such order as to lie directly one under another, to form any continued Passage from the Cavity to the external Plate. The second kind, viz. the Longitudinal, are not to be observed, but by good Glasses, unless it be now and then in some particular Bones. By these it is that the Medullary Oil diffuses it self, and is immediately beneficial to the Plates. The other (viz. the Transverse) and but subordinate to these, and rather designed for the Passage of the Marrow into them, than for the immediate Communication of it to the Substance of the Bone.

The *Medulla* contained in the Bones; consists (besides the Blood-Vessels) of an investing Membrane, in which are included Membranous Lobules and Bags, and in these Bags *Vesiculae* or Glandulous Bladders, very much like the Vesicular Substance of the Lungs. And these Glandular Bladders serve both for the Separation of the Medullary Oil from the Mass of Blood, and for the Reception and Conservation of it. In an Human Bone which he had preserved till the Medullary Oil was wholly evaporated, he found these *Vesiculae* remaining dry, but entire, and their Substance representing, in a manner, a Sponge. They seem to have Pores or immediate Passages out of one into another (as have also the Bags) by which the Oil has a freer Course to the Joints and Substance of the Bone, for whose Benefit it was designed. By the Strictest Enquiry he could never find any thing like Ducts (as pass from other Glandules) and indeed these are not here necessary, because the Oil is not carried from the Glandular Vessels to any large Receptacle, but flows out of the Superficies of the Marrow in as many Places as there are transverse Pores in the internal Lamel. The *Medulla* serves to oil the Substance of every Bone, which the drier it were, the brittle it would be: It lubricates also their Articulations, and hinders their Ends from being worn or over-heated with Motion; and it moistens likewise the Ligaments, by which they are tied one to another. But in these two last *Uses* it

is assisted by the Mucilage which is separated by the *Glandulæ Mucilaginosæ* (as he calls them) which he has observed in all the Articulations of the Bones, and are of the Conglomerate Kind, of which he speaks more in the next Chapter.

Now the manner of the Medullary Oyls insinuating it self through a Bone, and its being dispensed to all the Parts of it, is this: It first passes, being Liquid (as it all is while the Animal is alive) out of the Cavity, through the transverse Pores of the first Internal *Lamina*, and not having Pores of the same kind directly subjacent in the next Place to transmit it towards the outside of the Bone, it flows into the Longitudinal ones formed between these two (the first and second) Plates, and being carried along in them till it find some transverse Pores in the second Plate, it passes through these, which when it has done, it is obliged again to alter its course, to run into and flow along the straight Pores between the second and third *Lamina*. Thus it passes through and between the Places successively, till it has made its way to the External Plate.

Thus the Medullary Oyl is dispensed in all the Bones to those Plates which are contiguous, and have no intermediate Cavities to entertain any Medullary Glands of their own: But where the Plates stand at some distance (as they do in such Bones as have not any great Cavity) there are the small Caverns (above-mention'd) which are capable of containing some Medullary Glands, from whence the Plates have more immediately, and without the former method of Conveyance, the benefit of the Marrow.

He divides the *Blood-Vessels* of the Bones into *Nutritious* and *Medullary*. The most considerable of the Nutritious enter at the ends of the Bone, viz. the Artery at one end, and the Veins at the other. The Medullary commonly enter the Sides of the Bones (and that obliquely, as the Ureters do the Bladder) both by one *Foramen*.

There are no Nerves that are inserted into them (except into the Teeth) but these only run through the *Periosteum* that invests them.

Some Bones have large Cavities in them, as *Os Humeri*, and *Femoris*, the *Ulna* and *Radius*, *Tibia* and *Fibula*, the Bones of the *Metacarpus* and *Metatarsus*, of the Fingers and Toes, and of the *Os Hyoides*; to which may be added, the lower Jaws; though the Cavity compared with the magnitude of the Bone, hardly deserves to be filed large: Besides these large Cavities which are in the inside of the Bones, there are lesser Cells or Caverns in their Substance, which are found in all the Bones, even those which have a large Cavity. But of these before, when we spoke of the Distribution of the Marrow.

Besides the large Cavities and Caverns in the Inside or Substance of the Bones, most have *Superficial Cavities* or *Sinus's* which Dr. *Havers* distinguishes into *Sulci* or *Forrows* (which are the long ones) and *Pits*, as he calls the shorter ones. And they have besides, *Holes* for the Nutritious and Medullary Vessels, as was but just now observed.

On the outside of the Bones there are also to be observed, their *Prominences* or *Protuberances*, of which there be two kinds; for it is either a continued part of the Bone jetting manifestly above its plain Superficies, for the more commodious insertion of the Muscles, &c. and is called *Apothysis*, a *Process*; or else it is like an additional Bone grow-

ing to another by simple and immediate Contiguity, (and generally softer and more porous than it) and is called *Epithysis*, an *Appendage*. If the Protuberance of the Bone be round, it is called its *Caput*; under which is the *Cervix*, as in the upper-end of the Thigh-bone: If it be flat, it is called *Condylus*; if sharpe, *Corone*, from the similitude they have to other things, as *Styloides*, *Coracoides*.

Their *Uses* are many; for they serve, 1. For the Firmitude and Sustainment of the Body, like Beams and Pillars in Houles. 2. For a Defence to some Parts; so the Skull defends the Brain, the Ribs the Parts contained in the Breast. 3. For Progression or Walking, of which they with the Muscles are the only Instruments. 4. They give Shape to the Parts of the Body. These are their general Uses; as to their particular Uses, those will be shewn as we describe them severally.

BONIS non amovendis, is the Writ to the Sheriff of London, &c. to charge him, that one condemned by Judgment in a Nation, and profecting Writ of Error, be not suffered to remove his Goods until the Error be try'd.

BONNET, in Fortification, is a certain Work raised beyond the *Counterescarp*, having two Faces which form a Salient Angle, and as it were a small *Ravelin* without any Trench. The Height of this Fortification is three Foot, and it is environ'd with a double Row of Pallisadoes, ten or twelve Paces distant from each other. It hath a Parapet three Foot high; and is like a little advanc'd *Corps du Guard*.

BONNET a *Prestre*, or the *Priest's Cap*, in Fortification, is an Out-work having at the Head three Salient Angles, and two Inwards: It differs from the double *Tenaille* only in this, that its Sides instead of being Parallel are made like a Swallow's Tail, that is, narrowing or drawing close at the Gorge, and opening at the Head.

BONNETS, in a Ship are small Sails set on upon the Courfes, or her Main-Sail and Fore-Sail; when they are too narrow or shallow to cloath the Mast. The words are, *Lace on the Bonnet*, that is, fasten it to the Courfe; *Shake off the Bonnet*, that is, take it off the Courfe.

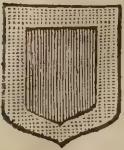
BOOM: That long piece of Timber with which the Clew of the Studding Sail is spread out, is called, the *Studding Sail-Boom*. A Boom is also used sometimes to spread or Boom out the Clew of the Main or Fore-Sail. The Seamen say a Ship comes *Booming* when she makes all the Sail she can. Also those Poles with Bushes or Baskets on the Top, which are placed to direct how to steer into a Channel, are called *Booms*, and by some *Beacons*.

BOOTES, the Name of a Northern Constellation of the fixed Stars; of which one in the Skirt of his Coat is called *Arcturus*, and is of the first Light on Magnitude. This Constellation is also called *Arctophylax*, and consists of 34 Stars.

BORBORYGM, a rumbling Noise in the Guts. *Blanchard*.

BORDLANDS, is the Demefns which Lords keep in their own Hands, for the maintainance of their Board or Table.

BORDURE, a Term in Heraldry, for an Ancient Difference in a Coat of Arms, whereby several Families of the same Name, or Persons bearing the same Coat are distinguished one from another. 'Tis a cutting off from within the Escutcheon all round it, about $\frac{1}{4}$ of the Field; and if the Line that constitutes the *Bordure* be frait, and



and the *Bordure* be plain, as they call it, then in Blazoning you must only name the Colour of the *Bordure*, as here, he beareth *Gules a Bordure Or*; without saying a *Plain Bordure*.

BORDURES, are sometimes *Engrailed*, *Gobonated*, *Inveiled*, *Indented*, *Counter Compny*, *Vairy*, *Checky*: Which see under those Words. If a *Bordure* be charged with any Parts of Plants or Flowers, they say *Verdoy of Trefoiles*, or whatever Flower it be. If the *Bordure* consist of *Ermins*, *Vairy* or any of the Furs, the Term is *Purflew of Ermins*. If the *Bordure* be charged with *Marlets*, the Word is, charged with an *Enalyron of Marlets*, &c.

BOREAL or *Northern Signs*, are the fix first Signs of the *Zodiack* or those on the *Northern* side of the *Equinoctial*.

BOROUGH *Englisb* (a Term in Law) is a customary descent of Lands or Tenements in some Places, whereby they come to the youngest Son; or if the Owner have no Issue, to his youngest Brother.

BOROW or *Borough*, signifies with us a Corporate Town, that is not a City.

BOROG-HEAD or *Head-borough*, is the chief Man of the *Decury* or Hundred.

BOSPHORUS (in Geography) is a long narrow Sea running in between two Lands, by which two Continents are separated; and by which way a Gulf and a Sea, or two Seas have a Communication one with another, as the *Thracian Bosphorus*, now called the *Straits of Constantinople*.

BOTANICKS or *Botany*, is that part of the Art of *Medicine* which describes and enumerates the several Virtues of Plants; and that part of *Natural History* which teaches rightly to distinguish the several Kinds and subordinate Species of Plants, Trees, Shurbs, &c. one from another, and which gives just Descriptions of them. And he that is accurate in this Art is called a good

BOTANIST: See Schemes of the several kinds of Plants under the word *Plant*.

BOTHRION, the Name of a kind of hollow, narrow, and hard Ulcer in the Eyes. *Blanchard*.



BOTTONY, a Term in Heraldry for one of their Crosses of this Figure, *Argent a Cross Botrony Sable*, by the Name of *Winwood*.

BOW, of a Ship, is that part of her which begins at the *Loof* and *compassing* Ends of the *Stem*, and ends at the *Sternmost* part of the *Fore-Castle*. If a Ship hath a Broad Bow, they call it a *Bold Bow*: If she hath a narrow thin Bow, they say she hath a *Lean Bow*. The Piece of Ordnance that lies in this place is called the *Bow Piece of Ordnance*; and the Anchors that hang here are called her *Great* or *Little Bower*.

BOW, a Mathematical Instrument made in Wood, formerly used by Seamen to take the Altitude of the Sun.

BOW, also, is a Beam of Wood or Brads with three long Screws, that govern or direct a Lath of Wood or Steel to any Arch; used commonly to draw Draughts of Ships, Projection of the Sphere,

or where-ever 'tis requisite to draw large Arches.

BOW-SPRIT, is a kind of Mast, resting slopeways on the Head of the main Stem, and having its lower End fastned to the *Partners* of the *Fore-Mast*, and farther supported by the *Fore Stay*: It carries the *Sprit-sail*, *Top-sail*, and *Jack-staff*; and its Length is the same with the *Foremast*.

BOWER, any Anchor carried at the Bow of a Ship is called her *Bower*: There are usually carried 2 there, the first and second *Bower*; but the greatest Anchor is carried in the Hold.

BOWLING, or rather *Bow-Line*, is a Rope fastned to the *Leach*, or middle part of the outside of the Sail; it is fastned in three or four parts of the Sail, which is called the *Bowling Bridle*; but the *Mizen Bowling* is fastned to the lower end of the *Yard*. All Sails have it except *Sprit-sail*, and *Sprit-sail Top-sail*, and therefore those Sails cannot be used close by a Wind; for the use of the *Bowling* is to make the Sails stand sharp, or close, or by a Wind: The Words belonging to it are these, *Sharp the Bowling*, *Hawl up the Bowling*, *Set fast the Bowling*, that is, pull it up hard, or hale it more, forward on; but when they say, *Ease the Bowling*, *check* or *run up the Bowling*; they mean, let it more slack.

BOWLING KNOT, is a Knot that will not slip, by which the *Bowling Bridle* is fastned to the *Cargles*.

BOWSE, a Sea Term, signifying as much as *Hale* or *Pull*. Thus haling upon a Tack, is called *Bowling upon the Tack*. And when they would have the Men pull all together they cry, *Bowse away*.

BOX and Needle, is the application of a small Compass to a *Theodelite*, and is used in *Surveying*, &c. to find out the Situation of Places, by the pointing of one end of the *Magnetical Needle* towards the North.

BOY, of an Anchor: See *Buoy*.

BOYAU, or *Branch of the Trenches*, in Fortification, is a particular Ditch separated from the main Trench, which in winding about encloseth different Spaces of Ground, and runs parallel with the Works and Fences of the Body of the Place; so that when two Attacks are made near one to another, the *Boyau* sometimes makes a communication between the *Trenches*, and serves as a *Line of Contravallation* not only to hinder the *Sallies* of the *Besieged*, but also to secure the *Miners*. But when 'tis a particular Cut that runs from the *Trenches* to cover some Spot of Ground, it is then drawn parallel to the Works of the Place, that it may not be *Enfiladed*; that is, that the Shot from the Town may not scoure along it.

BRACED, the Term in Heraldry for the intermingling of three *Chevronells*, thus;

Azure, a Chief Or, and three *Chevronells* Braced in the Base of the *Escutcheon*, by the Name of *Fitz-hugh*.



BRACES, are Ropes belonging to all the Yards of a Ship except the *Mizen*, two to each *Yard*; there is a *Pendant* seized to the *Yard Arms*, at whose other end there is a *Block*, through which the *Brace* is reeved, and their use is to *Square the Yard*, that is, to set it *Square*; to *Brace the Yard*, that is, to bring it to either side; to *Traverse the Yard* that is,

is, to let it any way overthwart; and to Right the Yard, that is, to bring it so that it shall stand at Right Angles with the Length of the Ship. All Braces come afterward on, the Main Brace comes to the Poop, the Main Top-sail Brace to the Mizzen top, and thence to the Main Shrouds; the Fore and Fore-top-sail Braces come down by the Main and Main-top-sail Stays; and so of all the rest. But the Mizzen Bowling serves for a Brace to that Yard, and the Cross-Jack Braces are brought forwards to the Main Shrouds whenever a Ship sails close by a Wind.

BRACHIÆUS Externus, is a Muscle of the Cubit, which seems to be the third beginning of the *Gemellus*; its Origination is continued from above the middle of the inferiour and back part of the *Os Humeri* to its Cavity, which receives the *Olecranium* Extension of the Cubit, where joining with the Tendinous Outside of the *Gemellus*, it is inserted with it as above said.

BRACHIÆUS Internus, is a Muscle of the Cubit, which derives its Name from its Situation, lying partly under the *Biceps*: It ariseth fleshy from the Internal Part of the *Os Humeri*, at the Insertion of the *Deltoides* and *Coracobrachialis* Muscles, and descending over the Juncture of the Cubit with the Arm-bone, it's inserted partly fleshy and partly Tendinous to the Superior and Forepart of the *Ulna*: Its use is to help bend the Cubit.

BRACHIOLUM, is a kind of Index or Label put upon Astralabes and other Projections of the Sphere; and by some English Writers is called a *Creeeping Index*.

BRACHYCATALECTICK Verse: See *Deposition*.

BRACHYGRAPHY, is the Art of Short-hand.

BRACKETS (in a Ship) are small Knees serving to support the Galleries; and so those Timbers are called that support the *Gratings* in the Head.

BRADYPEPSY, is slow Digestion, proceeding from a depraved Disposition of the Acid Ferment in the Stomach. *Blanchard*.

BRAILS, are small Ropes reeved thro' Blocks which are seized on either side the Ties, a little distance off, upon the Yard; so that they come down before the Sails of a Ship, and are fastned at the Skirt of the Sail to the Crengles. Their use is, when the Sail is furled a-crofs, to hale up its Bunt, that it may the more readily be taken up or let fall. These Brails belong only to the two Courses and to the Mizzen Sail. The word is, *Hale up the Brails*, or which is all one, *Brail up the Sails*; for the meaning is, that the Sail should be haled up, in order to be furled, or bound close to the Yard.

BRAIN (see *Cerebrum* and *Cerebellum*) in the general Sense of the Word, is taken for all the soft Substance which is contained within the whole Skull, and which the *Greeks* comprehended under the Word *ἑνκεφαλον*. It is the general Organ of Sense, in which the Soul, the Governour of the Body, perceives and judgeth of the Sensations of all the Sentient Parts; and out of which, as out of a Fountain, it communicateth the Animal Spirits (bred in the Brain) by the Ducts and Rivulets of the Nerves to all the Sentient Parts of the Body; and thereby endows them with the Faculty of performing Animal Actions.

The Brain being of so loose a Substance, and the Skull wherein it is inclosed so hard that the Saw or Chisel are necessary to break through it, the Brain must needs be very much flattened or compressed thereby; and after the Skull is divided, in the very pulling of it off, the vascular Connection

or the *Dura Mater*, and it with the *Pia Mater* and *Arachnoid* (and that also of the one with the other) being torn in funder, the Parts into which Vessels are inserted, are necessarily much violated: And lastly, after the Covers are removed, several parts of the Brain being of such difficult access, that others must be quite spoiled, before one can come to a view of them, and these also thereby in part violated: Upon all these accounts a true Anatomy of the Brain, as to its Contiguities, Connections, Cavities or Venticles, &c. must be very difficult; so that 'tis no wonder the Observation of Anatomists are so different, and so opposite to one another. But this by the bye, let us next discourse of the Brain more generally.

If by *Brain* we understand the whole *ἑνκεφαλον* (or all that which is contained within the Skull) it is not of one Substance, but divers; and is distinguished by the particular Names of the *Cerebrum*, (in special) the *Cerebellum* and the *Medulla oblongata*. Nor is the *Cerebrum* (properly so called) it self of a like Substance, but consisting of a Cortical and Medullar Part (called *Corpus Callosum* and these differ in their Nature, Colour and Consistence. Which difference *Malpighius* thus describes: The *Cortex* (being of an Ash-colour) he says, is Glandulous: The outside of the Glands is covered with the *Pia Mater*, and its Blood-Vessels, which penetrate deep into their Substance; (each Gland having a Twig of both an Artery and a Vein:) Their inner side sends forth a white Nervous Fibre, like a proper Vessel, as it were, so far as their Brightness and Whiteness permit one to discover. These Fibres make up all the *Pith* (or *Corpus Callosum*) which is of a more close and solid Substance than the *Cortex*. They are flattish round, and are not unlike those white Bodies, or *Intestinnula*, which the Testicles are made up of; and in the Venticles of the Brains of Fish they are so apparent, that if you hold them betwixt you and the Light, they represent the small Teeth of an Ivory Comb. He saith, they are inserted by their Ends into (or rather arise out of) the *Cortex* or Ash-coloured outer part of the Brain, and seem all of them to have their egres out of (or rather ingres into) the Trunk of the Spinal Marrow within the Skull.

Whether they be hollow or not, or whether as they are collected into a Bundle, they have not Pores and Interstices arising therefrom, which transmit a peculiar Juice into the Nerves continued to them, he leaves undetermined; because they neither admit of Ligature, nor can Sense make any discovery thereof. Dr. *Ridley* (from *Leuwenhoeck*) offers at a yet finer Description of these two Parts of the Brain, which the curious Reader may find in his *Anatomy of the Brain*, P. 89, &c. For the other Parts of the *Encephales*, viz. the *Cerebel* and *Medulla oblongata*. See these words.

The Brain receives Blood by Arteries derived from the *Carotides* and *Cervical*, whose Capillaries are dispersed chiefly through its Cortical Part. These Arteries are so large and numerous, that a third part, at least, of the whole Mass of Blood is conveyed hither by them; which seeing through the smallness of the Brain it cannot be consumed in its Nutrition, *Malpighius* thinks it probable, that the Coagulative (or Concrescible) Serum is filtered as it were in the *Cortex*, (or Glandulous Part) of the Brain from the Arterial Blood, and that the Fibres of the *Cortex Callosum*, as so many Roots implanted into the said *Cortex*, imbibe this Serum and convey it to the *Medulla Oblongata* as the Trunk from

from whence it is derived into the Nerves as the Branches, and is derived and is there the *Succus Nervo*, if not the Animal Spirit it self. Part nourishes the Brain it self, and what is superfluous to both these uses, is partly refused by the *Veins* of the *Meninges* (whose Twigs reach all the several Glands of the *Cortex*) and partly repositied in the *Sinu's* of the *Dura Mater*, by the Arteries themselves, out of which it is resorbed by the Internal Branches of the Jugulars, and thereby conveyed back to the Heart. The Arteries inosculate one with another (*i. e.* the Right *Carotides* with the Left) and so do the Veins also; but not the Arteries with the Veins. It is from the Pulse of the Arteries altogether, that the beating (or *Systole* and *Diastole* as it were) of the Brain proceedeth.

A Man of all living Creatures hath the biggest Brain; for it weigheth four or five Pound in some, and is as big again as an Ox's Brain.

The outer Surface is full of Windings, like those of the Guts, which are severally invested with the *Pia Mater*, as also tied together by it. The whole Brain is much of the same Shape with the Head, *viz.* roundish, but with bunchings out towards the Forehead.

BRANCH of the Trenches: See *Boyan*.

BREACH, in Fortification, is the Ruins which are made in any part of the Works of a Town, &c. either by playing Cannon, or springing Mines, in order to storm the Place, or take it by Assaults. They say, Make good the Breach, Fortifie the Breach with *Chevaux de Frise*, Make a Lodgment on the Breach; Clear the Breach; or move away the Rubbish of it, &c.

BREAK Ground, in Fortification, signifies to begin the Works for carrying on the Siege about a Town or Fort.

BREAMING, of a Ship: See *Erooming*.

BREAST-FAST, a Rope in a Ship made fast to some part of her forward-on, to hold fast her Head to a Warp, or the like.

BREAST-HOOKS, in a Ship, are the *Compas-fing* Timbers before, which help to strengthen her Stern, and all her Fore-part.

BREAST-ROPEs, in a Ship, are those which fasten the Parrels to the Yards.

BREAST-WORKS, the same with *Parapet*.

BREDWITE (in Law) seems to have been that Imposition of Fines or *Amerciaments* for Defaults in the Affize of Bread.

BREECHINGS; so the Seamen call those Ropes with which they *lasso fast*, or fasten their great Guns to the Ship-sides.

BREEZE, a shifting Wind, blowing from the Sea or Land for some certain Hours of the Day or Night.

BREGMA or *Pregma*, is the Fore-head Bone, according to some Writers, but its rather the *Sinciput*.

BREVE, the same with *Brief*.

BREVE *Perquirere*, to purchase a Writ or Licence of Trial in the King's-Court, by the Plaintiff, *qui breve perquiruit*. Hence the present usage of paying 6s. and 1d. where the Debt is 40l. and 18s. where the Debt is 100l. and so upward in Suits of Money due upon Bond.

BREVE *Reſto*, a Writ of Right, or Licence for a Person ejected, to Sue for the Possession of an Estate detained from him.

BREVE-VAS, a short Vein passing from the Stomach to the Veiny Branch of the Spleen. 'Tis commonly called the *Vas Breve*.

BREVIBUS or *Rotulis liberandis*, is a Writ or Mandate to a Sheriff, to deliver unto the new Sheriff, chosen in his room, the County with the appurtenances, *una cum Rotulis Breuibus*; and all other things belonging to that Office.

BREVIS, also is the Name for one of the Muscles of the Radius, serving to turn the Palm of the Hand upwards.

BRIBORS (a French Law term) signifying one that pilfereth another Man's Goods.

BRICOLS, are by some said to be Engines, formerly used to batter the Walls of the Towns or Castles.

BRIDGE Flying, a Term in Fortification: See *Pont Volant*.

BRIEF (or Breve) a Term in Law, signifying Process that Issues out of the Chancery or other Courts, commanding the Sheriff to summon or attack A, to answer to the Suit of B, &c. But more largely it is taken for any precept of the King in Writing under Seal, issuing out of any Court, whereby he commands any thing to be done for the furtherance of Justice and good Order.

BRIGADE, is a Party or Division of a Body of Soldiers, whether Horse or Foot. There are two sorts of Brigades according to the French way of accounting. (1.) A Brigade of an Army, which is a Body of Horse consisting of 10 or 12 Squadrons, or a Body of Foot of 5 or 6 Battalions: And this way an Army is sometimes divided into eight Brigades, four of Horse, and four of Foot. 2. A Brigade of a Company of Cavalry, is its third Part, when it consists only of 50 Officers; but its sixth Part when of 100. *Grand Dictionnaire Francoise*.

BRIGADIER, is he that commands any Brigade.

BRIGANTINE, is a small light Vessel which can both Row and Sail well, and is either for Fighting or giving Chase: It hath about 12 or 15 Benches for the Rowers, one Man to a Bench; all the Hands aboard are Soldiers, and each one hath his Musket lying ready under his Oar. *Great Fr. Dict. of Arts and Sciences*.

BRISURE, a Term by some Writers of Fortification, for a Line extended in Length from four to five Fathom, which is allowed to the *Certain* and *Orillon* to make a hollow Tower, or to cover the concealed Flank.

BRODE Halpenny, or Broad Half-penny, or Board-half-penny (a Term in Law) signifying, to be quit of certain Customs exacted for setting up of Tables or Boards in Fairs or Markets; and those that were freed by the King's Charter of this Custom, had this Word put in their Letters Patents; by reason whereof, at this Day, the Freedom it self, for brevity of Speech, is called *Broad Hal-penny*.

BROKEN Ray, or Ray of Refraction, in *Dioptricks*, is a Right Line, whereby the Ray of Incidence changeth its Rectitude, or is broken in traversing the second Medium, whether it be thicker or thinner.

BRONCHOCELE, is a Tumour in the Top or the middle Fistulous Part of the Wind-Pipe. *Blanchard*.

BRONCHOTOMY, is the Section of the Wind-Pipe in a Membraneous Part betwixt two of the Rings. It is used to prevent Suffocation in People troubled with a *Squinancy* or *Quinsy*.

BRONCHUS, is the Middle Fistulous Part of the Wind-Pipe, whose Fore Part is made up of so many little Rings; the upper Part is called *Larynx*, and

and the under *Vesicularis*. It serves for the Modulation of the Voice; and in Respiration.

The Ramifications of the *Aspera Arteria* or Wind-Pipe all over the Lungs, are called the *Bronchia* of the Lungs.

BROOMING; or *Brooming of a Ship*, is burning off the Filth she hath contracted on her Sides, with Straw, Reeds, &c. when she is on a Caren; or on the Ground; so that this is a kind of Graving.

BRUDGBOTE; or *Bridgebote*, a Law Term, signifying to be quit of giving Aid to the Repair of Bridges.

BRUMAL, is that which comes in Winter; as the *Brumal Solstice*, as some call the Winter one.

BRUSK: See *Tenny*.

BUBO, is the Groin; or Place from the Bending of the Thigh to the Privy-Parts; also a Tumour in the Groins; proceeding from the Pox or Pestilence. *Blanchard*.

BUBONOCÉLE, is a Rupture, when the Intestines fall into the Groin, or the outmost Skin of the *Scrotum*: Sometimes its taken for a Bubo or Swelling. *Blanchard*.

BUCCELLATION, by some Chymists, signifies a dividing into Gobbets.

BUCCINATOR, is the round circular Muscle of the Cheeks, thin and membranous, interwoven with various Fibres, and inseparably girt about with the Tunick of the Mouth. *Casseri* has observed a certain strong Band that grows outwardly in the Center of this Muscle, which spreading itself about the Cheek-bone, is terminated in a little slender Muscle directly opposite to that Part of the Face called *Bucca*: It arises from the Upper-Jaw-bone, and is fastned in the Lower, at the Roots of the Gums. Its Use is to move the Cheeks with the Lips; and serves as a Hand to the Teeth, whilst it tosse the Meat too and fro, and throws it upon the Teeth, that it may be more exactly chewed. This Muscle hath the Name of *Buccinator* from its forcing out the Breath of Trumpeters. Mr. *Cowper* saith, it springs not from the Ends of the Upper, nor Ends in that of the Under Jaw, nor is it of that Figure which vulgar Anatomists pretend, nor intermix'd with various Orders of Fibres; but that it arises broad and fleshy from the Fore Part of the *Processus Coronæ* of the lower Jaw, and from hence proceeding with direct Fibres, it adheres to the Gums of both the Jaws, and is so inserted to the Angle of the Lips. Besides its use in blowing the Trumpet, Horn, &c. it pulls the Mouth to one Side.

BUCOLICKS, are Pastoral Songs or Poems, such as the *Eclogues* of *Virgil*, and the *Idyls* of *Theocritus*.

BUDGE Barrels, are small Barrels filled with Gun-powder, having a Purse or Case of Leather made fast over their Head to prevent the Powder's taking Fire; they are used to carry the Powder in a-board a Ship.

BULBOUS Roots, are such as are described in the Word *Bulbus*.

BULBUS, in Botany, signifies the round Root of a Plant encompassed about with many Coats (like an Onion) one within another; or else set round thick with many small Scales; and which sends out many Strings or Fibres from the Bottom of the Bulb, or Base of the Root.

BULIMOS, or an Ox-like Appetite, that is, when the Hunger is somewhat greater than that

which is called *Fomes Canina*, or when the Stomach craves, but cannot receive, whereas in the other Case, the Eating is answerable to the Appetite. *Blanchard*.

BULK of a Ship, is her whole Content in the Hold for the Stowage of Goods.

BULK-HEADS, are Partitions made a-cross a Ship with Boards of Timber, whereby one Part is divided from another. The *Bulk-head* afore is the Partition between the Fore-Castle and Grating in the Head, and in which are the *Chafe Ports*.

BULLION, is taken for Gold or Silver in the Mafs or Billet; it is also the Place where Gold or Silver is brought to be tried and exchanged.

BULRUSH-BRIDGE, in Fortification, is a Bridge made of many Bundles of Bul-rushes bound together and covered with Planks, to secure a Passage over the Boggs, Marshes, and Fenny Places.

BULWARK, much the same (anciently) with a *Bastion* in Fortification: Which see.

BUNT of a Sail, is the middle Part of it, which is purposely formed into a kind of Bag or Cavity, that the Sail may receive the more Wind: It is chiefly used in Top-sails; for Courses are for the most part cut Square; or at least with a small Allowance for Bunt or Compass. They say the *Bunt* holds much *Leeward-Wind*; i. e. the *Bunt* hangs too much to Leeward.

BUNT-LINES, are small Lines made fast to the Bottom of the Sails in the middle Part of the *Bolt-Rope* to the Crengle, and so are reaved thro' a small Block seized to the Yard; their use is to trice up the Bunt of the Sail for the better furling of it up.

BUOY: A *Buoy* at Sea is a Piece of Wood or a Barrel fastned so as to float directly over the Anchor, that so the Men that go in the Boat to weigh the Anchor may certainly know where it lies. The Term of Art is, *Stream the Buoy*, that is, let the Anchor fall while the Ship has way. From hence the word *Bouyant* signifies any thing that is floating or floatable.

To *buoy up a Cable*, is to fasten some Piece of Wood or Barrel, &c. to the Cable near the Anchor, that the Cable may not touch the Ground when they suspect the Ground to be foul (that is, Rocky) lest the Cable should be fretted and cut off.

BUOYS, are also used at Sea to discover Rocks and Shelves, by being fastned over them.

BURBREACH (a Term in Law) is to be quit of Trespasses committed against the Peace in City or Borough.

BURGAGE, is a Tenure proper to Cities, Boroughs and Towns, whereby the Burghers, Citizens or Townsmen, hold their Lands or Tenements of the King, or other Lords, for a certain Rent.

BURGMOTE, is a Court of a Borough or City.

BURGHBOTE, is a Contribution towards the Building or Repairing of some Castles or Walls of Defence, or towards the Building of a Borough or City: From which Duty several Persons had obtained an Exemption by the Ancient Charters of our *Saxon* Kings; whence the Word is often taken for the Liberty or Exemption from such Customary Service.

BURGLARY, naturally signifies the Robbing of a House, but in a Legal Sense is a Felonious entering

tring into another Man's Dwelling; wherein some Person is, or into a Church in the Night-time, to the End to commit some Felony, or to Kill some Man, or to Steal somewhat thence, or do some other Felonious Act, albeit he executes not the same.

BURNING-GLASS. One M. *Villette* made a Metalline Burning Conclave at *Lyons in France*, of a round Figure, 30 Inches Diameter, and of about 100 lb. weight. The *Focus* or burning Point being distant from the Conclave about 3 Foot; and its Bigness, that of $\frac{1}{2}$ of a *Louis D'Or*: It would melt Iron in 40 Seconds, Silver in 24, Copper in 42; and turn'd Quarry Stone into Glass in 45, and Mortar in 53 Seconds: It melted a piece of Watch Spring of Steel in 9 Seconds. *Phil. Transf. N. 6.*

After that *Villette* made another of 34 Inches Diameter, which would melt all sorts of Metals of the thickness of a Crown Piece in less than a Minute, and vitrify Brick in the same time. *Phil. Transf. N. 49.*

Francis Smithwick, Esq; F. R. S. produced before the Royal Society, Feb. 27. 1664, 2 Burning Concave Glasses, of a Figure not Spherical; one of 6 Inches Diameter, and its *Focus* 3 Inches distant from the Center; the other of the same Diameter but less Concave, and its *Focus* 10 Inches distant. Those when approached to a large Candle lighted, did somewhat warm the Faces of such as were 4 or 5 Foot distant at least; and when held to the Fire, burned Gloves and Garments at 3 Foot distance from the Fire: He did also with the deeper of them, in the presence of Bishop *Ward*, turn a Piece of Wood into Flame in 10 Seconds of Time, and with the shallower in 5 Seconds, in *Autumn*, about 9 in the Morning, and the Weather gloomy. *Phil. Transf. N. 33.*

BURNING-ZONE: See *Zone*.

BURSALIS: *Vid. Marsupialis.*

BURTON, on Board a Ship, is a small Tackle to be fastned any where at pleasure, consisting of two single Pulleys: Its use is to hoist small things in or out: and this will purchase more than a single Tackle with two Blocks.

BUST, is a Term in Sculpture, signifying a Figure or Statue of but one half of a Human Body; the Head, Shoulders and Breasts appear, but no Arms, and it is made tapering from the Breast downwards.

BUSTROPE, *i. e. Boum Versatio*, the turning of Oxen when they Plow the Ground: This (as

Marius Victorinus tells us) was the Antient manner of Writing among the *Romans*, who at first writ as it were in Furrows, the first Line beginning at the Left-hand went to the Right, and then the second beginning at the Right-hand was continued back to the Left; and so it lookt like the Furrows of Land Plowed by Oxen.

BUTT, in the Sea Language, is the End of any Plank which joins to another on the outside of a Ship under Water; and therefore when a Plank is loose at one end, they call it *Springing a Butt*; to prevent which, Ships are usually bolted at the *Butt Heads*, that is, at the Planks End.

BUTTER of *Antimony*, or as some call it, the *Ice Oyl* of that Mineral is a great *Caustick* made by uniting the Acid Spirits of Sublimate Corrosive with Regulus of Antimony, thus,

Six Ounces of Regulus is mix'd with a Pound of Sublimate, both powdered, and then the matter is put into a Glass Retort, whose half must be empty; Distill in Sand with a small Fire at first, a little clear Oyl; then encrease the Fire, and a white thick Liquor like Butter will come forth; which if a Pan of Coals be not applied to melt it, will choke up, and it may be, break the Neck of the Receiver; continue the Fire till the Red Vapours come. Then unlute the Receiver, and if you have a mind to recover the Mercury, apply another filled with Water in its room, the Quicksilver will run over into the Water. This *Butter of Antimony* is used to eat Proud Flesh, and to cleanse Ulcers.

BUTTER of *Tin*, is made after the same manner, of one part of Tin in Powder and three parts of Sublimate Corrosive; and what is very strange of this Jovial Butter, it is continually emitting Fumes, or Smoaking.

BUTTOCK of a Ship, is that part of her which is her Breadth right a Stern from the Tack upwards; according as a Ship is built broad or narrow at the Transom, she is said to have a broad or a narrow Buttock.

BUTTRESS, is an Arch or Mass of Stone serving to support the sides of a Building, Wall, &c. on the outside: They are chiefly used in such Buildings as are of the *Gothick* manner.

BY-LANDER, See *Belandre*.

BY-LAWS, are Orders made in Court-Leets or Court-Barons by common consent, for the good of those that exact them, and which extends farther than the Publick Law binds. *Blunt.*

BYQUARTILE, the same with *Biquartile*.

C A D

CABALLINE *Alloes*, is a courser fort, which being generally used by Farriers to purge Horses, is called by this Name of *Caballine Alloes*.

CABLE of a Ship, is (as is well known) a great Rope of 3 Strands, which being fastened to the Anchor holdeth the Ship fast when she rides. The Sea Terms about it are, 1. *The Cable is well laid*, that is, is well wrought or made. 2. *Serve the Cable*, or *Plat the Cable*, that is, bind it about with Ropes, Clouts, &c. to keep it from galling in the Hawse. 3. *To splice a Cable*, is to make two Pieces fast together, by working the several Strands of the Rope one into another. 4. *To Quale the Cable*, is to roll it up round in a Ring, of which the several Rolls one upon another are called *Cable Tires*. 5. They say, *Pay more Cable*, that is, let it more out from the Ship, that the Boat which carries the Anchor may the more easily drop it into the Sea; and sometimes they say *Pay cheap the Cable* (i. e.) put or hand it out apace. In the same Sense, as *Pay more Cable*, they say also *Veer more Cable*, that is, hand or let more out. When two Cables are spliced together, 'tis called *A Short of a Cable*.

CABOSED (*Spanish*) the Term in Heraldry for the Head of any Beasts, being cut off just behind the Ears by a Section parallel to the Face, or by a perpendicular Section; whereas *Couping* is usually expressed by an Horizontal one, and is never so close to the Ears as *Cabosing*.

CABURNS (in a Ship) are Lines used to bind Cables withal; they are usually made of *Rope Yarn* or *Spun Yarn*.

CACATORIA *Febris*, is an intermittent Fever (so called by the famous *Sylvius*) accompanied with a violent Purging, which is sometimes griping and very painful, extremely afflicting and weakning to the Patient.

CACHECTICUS, is one that has an ill Habit of Body.

CACHEXY, is an ill Habit of Body, proceeding from a bad Disposition of the Fluids and Humours; whence lingering Fevers, Consumptions and Dropsies are contracted: In this Disease the Face is often Pale and Discoloured, and the Body big and swollen. *Cachexia*, taken also in a large Sense, is opposite to *Diæxia*, and as a good Habit of Body is common to all sound Parts, so an ill one is propagated by all the ill Parts. Strictly, *Cachexy* is only taken for an ill Disposition of the Habit of the Body; and *Euxexia*, on the contrary, for a good Disposition of the Humours, or Blood, and Body. *Blanchard*.

CACOCHYMY, is the abundance of ill Humours in the Blood; and it is either Ulcerous, Bilious, Pituitous, Melancholick, Acid, Salt or Sharp. *Blanchard*.

CACOTHESES, *Chironium Ulcus*, or *Telephium*; is a Disease or Ulcer beyond Cure, which is called a Malignant Ulcer; this happens when an Ulcer is Callous or Sinuous, under which there sometimes lie little putrified Bones that have fallen down. *Blanchard*.

CADENCE, or *Clofe*, in Musick, is a kinds of Conclusion of the Tune, which is made of all the Parts together in divers Places of any Key.

C A L

CADUCUS *Morbus*, or the *Epilepsy*, is a Convulsive Motion of all the Parts of the Body, more especially in the Hands and Feet, accompanied with a Deprivation of the Inward and Outward Senses.

CÆCUM *Intestinum*, the Blind Gut, so called because one End of it is shut up inasmuch that *Fæces* and *Chyle* both come in and go out at the same Orifice. Its Use in Man is obscure, as being very small and commonly empty.

CÆSAREAN *Section*, the cutting open of a Woman's Belly or Womb, to make way for the Child to be taken out.

CÆSURA, in Grammar, is when in a Latin or Greek Verse there remains a Syllable after a Foot, and that Syllable ends the Word. Of this they reckon four sorts, *Triemimeris*, *Penthemiris*, *Heptemimeris* and *Ennemimeris*: Which see.

If it were not for this *Cæsura*, few Verses could be made to run well; as is plain in these two, where there is no *Cæsura* at all,

*Auræa Carmina, Juli, scribis, maxime vaturn
Urbem fortem cepit nuper fortior Hostis.*

CAISSON, or Superficial *Fourneau*, is a Wooden Case or Chest, into which 3, 4, 5, or 6 Bombs, according to the Execution they are to do, or as the Ground is firmer or looser (sometimes the Chest is, only filled with Powder) when the Begged dispute every Foot of Ground, this *caisson* is buried under some Work the Enemy intends to possess himself of, and when he is Master of it, they fire it by a Train conveyed in a Pipe, and so blow them up. Thus they say after the Mine had destroyed the Bonnet, *A Caisson was buried under the Ground thrown up, and the Enemy advancing to make a Lodgment on the Ruins of the Bonnet, the Caisson was fired, and blew up the Post the second time.*

CAISSON, is also a covered Waggon to carry Bread or Ammunition.

CALAMUS *Scriptorius*, is a certain Delatation in or about the 4th Ventricle of the Brain, whose lower Part is inserted into the *Medulla Oblongata*, making there a Cavity in Shape of a Pen; whence it was anciently called *Calamus Scriptorius*.

CALCANEUS, or Os *Calcis*, the *Heel Bone*, is a Bone of the *Tarsus*; it lies under the *Astragalus*, to which it is articulated by the *Ginglymus*. Behind it has a large Protuberance which makes the Heel, and into which the *Tendo Achillis* is inserted; and before it has a Cavity which receives a Part of the Os *Cubiforme*.

CALHOIDEA, are three little Bones in the Foot, which, with others, make up that Part of the Foot succeeding the Ankle; and *Fallopins* calls them *Cuneiformia*, because they are made like Wedges.

CALCINATION, is the Solution of a mixed Body into Powder by Fire, or any corroding things, as *Mercury*, *Aquaforris*, &c. and when Horns, Bones, Hoofs, &c. are hanged over boiling Water (or other Liquor) till they have lost their Mulcilage and will easily be powdered, this by some Chymists, is called *Calcination Physyosophical*.

CAL-

CALCINATION of Copper : See *Æs Ustum*.

CALCINATION of *Flints*, or of *Crystal*, *Pebbles*, &c. is made by heating them red hot, and then casting them, whilst so, into cold Water or Vinegar ; for after this is done 4 or 5 times, they will be very friable, and easily powdered, for which end they are calcined.

CALCINATION of *Lead*, melt the Mettle in an Earthen Pan unglazed, keep it stirred over the Fire with a *Spatula*, till it be reduced into a Powder. This is what they call *Calx* of *Lead*, and by this Means the Metal is made more open and fit to be wrought upon by Acids. *Lead*, as well as *Tin*, sensibly encreases its Weight in Calcination.

CALCINATION of *Tin*. Put *English Tin* into a large Earthen Pan unglazed in a great Fire, and then the *Tin* will melt ; continue the Fire very strong for 36 Hours, stirring the Matter with an Iron *Spatula* from time to time ; then take it off the Fire and let it cool, and you will have the *Calx* of *Tin*. The *Tin* will encrease its Weight in this Operation, for 32 Ounces of Metal will yield 34 Ounces of *Calx*.

CALCINATION of *Vitriol*, is usually of the Green sort ; 'tis put over the Fire in an Earthen unglazed Pan ; the *Vitriol* will dissolve into a kind of Water ; then 'tis boiled till the Moisture be consumed, or till it return into a greyish Mass. This is called *Vitriol Calcined to Whiteness*. Then if it were kept long over a strong Fire, it would turn Red, and is then called *Colcothar*.

CALCIS : See *Calcanens*.

CALCULATION of Clock and Watch-work : See *Clock* and *Watch-work*.

CALCULUS Differentialis, is the Arithmetick of the infinitely small Differences between variable Quantities : This, in *England*, we call the *Arithmetick of Fluxions* : See *Fluxions*.

CALCULUS Integralis, is the Method of finding the proper flowing Quantity of any given Fluxion ; and is the Reverse of the *Calculus Differentialis*, which finds the Fluxion from the flowing Quantity.

CALENDAR, or *Almanack*, is a Political Distribution of Time accommodated to Use, and taken from the Motions of the Heavenly Bodies : Of this kind are those Annual Books wherein the Days of the Month, the Festivals, the Sign the Sun is in, the Sun's Rising and Setting, the Changes of the Moon, &c. are exhibited ; which we also call *Almanacks*. But the Word *Calendar* seems to come from the *Calendæ*, which, amongst the *Romans*, were the first Days of every Month.

There have been many Corrections and Reformatations of the *Calendar* : The first was made by *Numa Pompilius* ; and this afterwards was much improved by *Julius Cæsar*, and was by him called the *Julian Account*, which, in our Nation, and some other Places, is still retained, and is called *Old Style*.

Pope Gregory the XIIIth pretended to reform it again, and ordered his Account to be current, as it still is in all the *Roman Catholick Countries*, where 'tis called the *Gregorian Calendar* ; and with us *New Style* : It now begins eleven Days before ours.

A particular Account of the Nature of the *Julian* and *Gregorian Account*, see in a Book called, *The Julian and Gregorian Year* : And how both are pretended to be reform'd, see in a sticht Pamphlet called, *The Reformed Calendar* : Printed for Sam.

Manship, at the Ship near the Royal-Exchange Cornhill, 1701.

CALENDAR Astronomical : See *Astronomical Calendar*.

CALENDUS, so the *Romans* call'd the first Days of every Month, from the Greek Word *καλέω*, *voco*, to call ; because anciently counting their Months by the Motion of the Moon, there was a Priest appointed to observe the Times of the New Moon ; who having seen it, gave Notice to the President over the Sacrifices, and he called the People together, and declared unto them how they must reckon the Days until the *Nones*, pronouncing 5 times the Word *καλέω*, if the *Nones* happened on the 5th Day, or 7 times if they happened on the 7th Day of the Month.

CALIBRE, or *Caliper*, is the Bigness, or rather Diameter of a Piece of Cannon, or any Fire Arms, at the Mouth.

CALIPERS, is an Instrument made like a Sliding-Rule, to embrace the two Heads of any Cask, to find the Length. There is also the *Gunnars Calipers* or *Compasses* for finding the Diameter of the Ball, and Bore of the Gun.

CALIPER Compasses, are *Compasses* used by *Gunnars*, with crooked or bowing Legs, to measure the Diameters of Bullets and Cylinders of Guns.

CALKING or *Cauking* of a Ship, is driving in Oakum, or something of that kind, into the Seams of the Planks, to prevent the Ship's Leaking.

CALLICREAS : See *Pancreas*.

CALLIPICK Period, was an Improvement of the Cycle of *Meton* of 19 Years, which *Callippus*, a famous *Grecian Astronomer*, finding in reality to contain 19 of *Nabonassor's* Years, 4 Days and $\frac{11}{30}$ he, to avoid Fractions, quadrupled the *Golden Number*, and by that Means made a new Cycle or Period of 76 Years ; which time being expired, he supposed the Lunations or Changes of the Moon would all happen on the same Day of the Month, and Hour of the Day, that they were on 76 Years before.

CALLOUS : A Swelling is said to grow *Callous*, when 'tis hardened, as sometimes the Lips of a Wound. This is derived from

CALLUS, which is a kind of Swelling without Pain, like Skin contracted by too much Labour. *Blanchard*.

CALTHROPS : See *Chanse-trapps* or *Cowse-feet*.

CALVA, the Hairy Scalp, or upper Part of the Head, which either by Disease or Old Age grows Bald first.

CALX, in Chymistry, is that which is produced by Burning or Calcination (which see) of any Metal or Mineral in a Crucible, &c.

CALX, is the second Bone in that Part of the Foot which succeeds the Ankle, bigger and stronger than the rest ; oblong and grows backward, that a Man may stand more strongly upon it, and not fall so easily backward.

CALX also is that which by Calcining is either turned into *Alcoal*, as *Calx Saturni*, or at least is made friable, as *Hart's-Horn* burnt.

CALX of *Antimony* : See *Antimonium Diaphoreticum*.

CALX of *Gold* : Though it hath been look'd upon as a thing of great Difficulty, yet the Noble Mr. Boyle tells us, that if you grind well together a thick *Amalgama* of Gold and Mercury, with at least

least an equal Weight of finely powdered Sulphur, and then put the Mixture to sublime in a proper Glass, there will rise, by Degrees of Fire, a Cinnabar; and this will leave behind it a finer Calx of Gold than is to be had by some far more difficult Processes. See the *Mechan. Product of Volatility*.

CALYX, in Botany, signifies the Cup which contains or encloses the Flower in any Plant; and sometimes 'tis used for the Flower it self when its Figure is like that of a Rose, and not yet having its Leaves Expanded.

CAMBRING, the Sea-man say a Deck lies *Cambring* when it doth not lie Level, but higher in the Middle than at either End. Also if her Keel is bent in the Middle upwards (which may happen from her lying a-ground on a place where neither her Aft nor Fore-part do touch it, and from many other Reasons taken from her make) they say she is *Chamber-keel'd*.

CAMERA Obscura: See *Obscura Camera*.

CAMPAIGN, is a Military Term, signifying the Space of Time during which Armies are maintain'd every Year in the Field. So a Man is said to have made twenty Campaigns, when he hath spent so many Years in War-like Service in the Field.

CAMP Flying, is a strong Body of Horse and Foot commanded usually by a Lieutenant General, which is always in Motion, both to cover our own Garrisons, and to keep the Adverse Army in continual Alarm.

CANAL, is a Word frequently used by Anatomical Writers, to signify a Channel or Passage, thro' which any Juices or Fluids of the Body do flow.

CANALICULUS Arteriosus, is a Vessel betwixt the Arterious Vein in the Lungs, and the great Artery in the *Fœtus*; for its obliterated in Adult Persons: It's Use in *Fœtus*'s is, that the Blood may be discharged by this *Ductus* out of the Arterious Vein, into the great Artery, because that the Blood is not accended in the Lungs, for want of Respiration in the Womb.

CANCER, one of the 12 Signs of the Zodiack, drawn on the Globe in the form of a Crab, and thus marked ☊. Thro' the beginning of this Sign passeth a Circle parallel to the Equinoctial, called the *Tropick of Cancer*, or the Northern *Tropick*; to which Circle, when the Sun comes, it makes the *Summer Solstice*, and is turning his Course back again towards the Equinoctial.

CANCER, an Ulcerous Disease: See *Carcinoma*.

CANICULA, the same with *Canis Minor*.

CANINA Fames, or *Dogs-Appetite*, is an inordinate Hunger attended with a Vomiting and a Looseness, which proceeds from a depraved Action of the Stomach, craving Food in a greater Measure than Nature requires.

CANINI, are two Teeth in each Jaw, one on each side of the *Incisivi*; they are pretty thick and round, and they end in a sharp Point; they have each one Root which is longer than the Roots of the *Incisivi*; their proper use is to pierce the harder kinds of Meat.

CANINUS, a Muscle of the Lip, serving to put the Lips upwards.

CANIS Major & Minor, the greater and lesser Dog, are two Constellations of Stars drawn upon the Globe in Figure of this Animal; and the greater

of them hath in his Mouth that vast Star called **CANICULUS**, or the *Dog-star*, which rising and setting with the Sun from about the 24th of July to the 28th of August, gives occasion to that time which is usually very Hot and Sultry, to be called the *Canicular* or *Dog-days*.

CANNA Major: See *Tibia*.

CANNA Minor: See *Fibula*.

CANNON Royal, is a Piece of Ordnance 8 Inches Diameter in the Bore, 12 Foot long, weighs 8000 lb. its Charge 32 lb. of Powder; its Ball of 48 lb. weight, and 7 Inches $\frac{1}{2}$ in Diameter, shoots point blank 185 Paces. This is the same with a Cannon of Eight.

CANNON, a Piece of Ordnance: See *Ordnance*.

CANON, in Mathematicks, is a Rule to solve all things of the same Nature with the present Enquiry: Thus every last step of an Equation in Algebra is such a Canon, and if turned into Words is a Rule to solve all Questions of the same Nature with that proposed. Canon also is the Word for the Tables of Logarithms, Artificial Sines, Tangents, and Secants, which are of admirable use in Trigonometry. 'Tis also the Name of a Surgeon's Instrument, which they make use of when they sew up Wounds.

CANONICAL Equations: See *Quadratick Equations*.

CANON-LAW, is a Collection of Ecclesiastical Rules, Definitions and Constitutions taken from the Ancient, General and Provincial Councils, the Writings and Resolutions of the Fathers of the Church, and the Rescripts of Popes. This Law is modelled according to the Form of the Civil, and is reduced into 3 Volumes. The first is called the *Decrees of Gratian*, and is composed of the Ancient Canons, and Collected from the Ancient Councils and Writings of the Fathers.

The 2d Volume is called the *Decretals*; and doth contain the *Decretal Epistles* or *Rescripts* of Popes, and chiefly from Alexander III. to Gregory IX. by whose Authority it was compiled.

The 3d Volume is called *Sextum*; and contains the Rescripts of the Popes from Gregory IX. to Boniface the VIII. by whose Authority it was Collected. To the End of this Volume are added the *Clementina*, which are the *Constitutions* of Clement V. enacted in the Council of Vienna, as also the *Extravagants*, which are some Rescripts of Pope John XXII. and some other Popes. They were called *Extravagants*, because not contained in the Body of the *Canon Law*; which is composed of the three lately mentioned Volumes.

CANTHUS or *Hircus*, is the Angle or Corner of the Eye; which is either the greater or the Internal, or the less, or External.

CANTON, an Ordinary in Heraldry, framed of two strait Lines, one drawn perpendicularly from the Chief, and the other so from the Side of the Escutcheon. This is always less than a Quarter of the Field; and if drawn from the Left Corner of the Escutcheon, is called a *Canton Sinister*. Its Form is thus; He beareth Ermin, a Canton Argent charged with a Chevron Gules, by the Name of Middleton.



CANVAS-BAGS, or *Earth-Bags*, *Sacs a Terre*, as the French call them, are Bags holding about a Cubick

Cubick Foot of Earth, and are used to raise a Parapet in haft, or to repair one that is beaten down: They are chiefly used when the Ground is Rocky and affords no Earth to carry on the Approaches, then are these Bags of Earth very necessary, which can be filled at another place and removed at pleasure: These Bags are sometimes upon occasion filled with Powder, of which they hold about 50 Pound.

CAP, in a Ship, is a Square Piece of Timber, put over the Head or upper End of any Mast, having a round Hole to receive a Mast. By these Caps the Top-Masts and Top-Gallant-Masts are kept steady and firm in the Tressel-Trees, where their Feet stand, as those of the lower Masts do in the Steps. They call also that Piece of Lead which is put over the Touch-hole of a great Gun to keep the Prime from being wasted or spilt, the Cap of the Gun.

CAP-SQUARES, are broad Pieces of Iron on each Side of the Carriage of a great Gun, and lock'd over the Trunnions of the Piece with an Iron Pin: Their use is to keep the Piece from flying out of the Carriage, when 'tis shot off with its Mouth lying very low, or as they call it, under Metal.

CAPACITY (in Law) signifies the Ability of a Man, or Body Politick, to give or take Lands or other things, or sue Actions.

CAPACITY, in Geometry, is the solid Contents of any Body: Also our Hollow Measures for Wine, Beer, Corn, Salt, &c. are called Measures of Capacity.

CAPE, is a Writ Judicial, touching Plea of Lands or Tenements; and divided into *Grand-Cape* and *Petit-Cape*, both which takes hold of things immoveable, and seem to differ in this, that the *Grand-Cape* lieth before Appearance, and *Petit-Cape* afterwards.

CAPE, or Promontory is any high Land running out with a Point into the Sea, as *Cape Verde*, *Cape-Horn*, the *Cape of Good Hope*, &c.

CAPE *Parvum*, is a Writ that lieth in case where the Tenant is summoned in Plea of Land, and cometh at the Summons, and his Appearance is of Record; and after he maketh Default at the Day that is given to him, then this Writ shall go for the King.

CAPE *ad Valentiam*, is a Writ of Execution or a Species of *Grand Cape*, so called of the End whereunto it tendeth: In the *Old Nat. Erev.* it is thus described; This Writ lieth, where any impleaded of certain Lands, and he vouches to warrant another, against whom the Summons *ad Warrantizandum* hath been awarded, and the Vouchee comes not at the Day given; then if the Demandant recover against the Tenant, he shall have his Writ against the Vouchee, and shall recover so much in Value of the Vouchee's Land, if he have so much; and if he have not so much, then the Tenant shall have Execution by this Writ, of such Lands and Tenements as descend to him in Fee-simple; or if he purchase afterwards, the Tenant shall have against him a Re-summons, and if he can say nothing, he shall recover the Value.

Note, This Writ lies before Appearance.

CAPELLE, a bright fixed Star in the Left Shoulder of *Ariga*, whose Longitude is 77 Deg. 16 Min. Latitude 22 Deg. 50 Min. Right Ascension 73°. 7'.

CAPIAS, is a Writ of two sorts, one before Judgment, called *Capias ad Respondendum*, in an Action Personal, when the Sheriff upon the first Writ of Distress, returns *nihil habet in ballive nostra*; and the other is a Writ of Execution after Judgment, which are of divers kinds, as these following.

CAPIAS *conductus ad proficiendum*, is a Writ for taking up such as having received Prest Money to serve the King, flink away, and come not in at the time: This is an Original Writ directed to the Serjeant at Arms, to arrest and bring them in, having included a Clause of Assistance.

CAPIAS *pro fine*, is, where one being by Judgment fined unto the King, upon the same Offence committed against a Statute, doth not discharge it according to the Judgment, for by this is his Body taken and committed to Prison, until he content the King for his Fine.

CAPIAS *ad Satisfaciendum*, is a Writ of Execution after Judgment, lying where a Man recovers in an Action Personal, as Debts, or Damages, or *Detinue* in the King's Court; and he against whom the Debt is recovered, and hath no Lands nor Tenements, not sufficient Goods, whereof the Debt may be levied: For in this Case he that recovereth shall have this Writ to the Sheriff, commanding him, that he take the Body of him against whom the Debt is recovered, and he shall be put in Prison until Satisfaction made.

CAPIAS *uilegatum*, is a Writ of Execution which lieth against him that is out-law'd upon any Suit, by which the Sheriff, upon the Receipt thereof, apprehendeth the Party out-lawed for not appearing upon the *Exigent*, and keepeth him in safe Custody till the return of the Writ, then bringeth him into Court, there further to be ordered for his Contempt.

CAPIAS *uilegatum & Inquiras de bonis & catallis*, is a Writ all one with the former, but it gives a farther Power to the Sheriff, besides the Apprehension of his Body, to enquire of his Goods and Chattels.

CAPIAS *in Withernamum de homine*, is a Writ that lieth for a Servant in *Withernam*.

CAPIAS *in Withernam de Averis*, is a Writ that lieth for Cattle in *Withernam*.

CAPILLAMENTS, *Capillamenta*, are those small Threads or Hairs (whence the Word) which grow up in the middle of a Flower, and are adorned with little Knops at the Top: Those Knops are called the *Apices* of a Flower; and these *Capillaments* are called the *Stamina*.

CAPILLARY Plants, are such as have no main Stalk or Stem, but grow to the Ground, as Hairs to one's Head, and which bear their Seeds in little Tufts, Bunches or Protuberances on the Back-side of their Leaves, whence by some they are called *Dorsipare* and *Tergiferae*. And these are either with an

Undivided Leaf, as the *Hemionitis* and the *Phyllitis*; or with a

Singly divided Leaf; and these have the Leaf either cut or jagged in, but not divided into *Pinne* clear home to the main Rib; as *Polypodium*, *Lonicitidis*, *Scolopendria*, *Adiantum*, *Acrostichon Thal*.

Or else divided quite home to the Rib, and hanging like *Pinne*; as the *Chamaefelix Marina* and the *Trichomanes*. Others have the Leaf

Doubly divided, or at least once subdivided; the first Division being into *Branches*, and the 2d into *Pinne*;

Pinne;

Pinne; as the *Hemionites Multifida*, the *Filix mas*, the *Filix Palustris*, *Filix Saxatilis*, the *Adiantum Album*, and *Nigrum*. And others have the Leaf

Treble divided, or twice subdivided, viz. first into Branches, then into little Twigs, and after this into *Pinne*; and these are the *Filix Scandens* of *Brasile*, the *Filix Florida* or *Osmunda Regalis*, the *Filix mas Ramosa*, the *Filix Femina Vulgaris*, the *Adiantum album Floridum*, and the *Dryopteris Nigra*. Ray's *Historia Plantarum*.

CAPILLARY Vessels, small Veins and Arteries, like Thread or Hairs.

CAPILLATION, according to some Writers, is a Fracture in the Skull, so small that it can scarce be found, which yet often proves mortal.

CAPITATÆ Plantæ, in Botany, are such Plants whose Flowers are composed of many edged and hollow little Flowers; and Mr. Ray calls them by this Name, because their Scaly Calyx (or Cup of the Flower) most usually swells out into a large and round Belly, containing within it the Pappous Seed; as *Carduus*, *Centaury*, *Knopweed*, *Cinara*, *Cirsium*, *Lappa maj.* *Gyanus*, &c.

CAPITAL of a Bastion, in Fortification, is a Line drawn from the Angle of the Polygon to the Point of the Bastion, or from the Point of the Bastion to the Middle of the Gorge. These *Capitals* are from 35 to 40 Fathom long, that is to say, from the Point of the Bastion to the Place where the two Demigorges meet.

CAPITAL Line: See *Line*.

CAPITAL, or *Chapital*, or *Chapiter*, signifies in Architecture the Top of a Pillar; and this is different, according to the different Orders.

CAPITE, is a Tenure that holds immediately of the King, as of his Crown, be it by Knightservice or Soccage, and not of any Honour, Castle or Mannor.

CAPITULUM, in Botanicks, is the Head or Flowing Top of any Plant, being composed of many Flowers and Threads (or *Stamina*) closely connected in a Globous, Circular or Discous Figure; as the Flowers of *Blew-bottles*, *Scabiins*, *Carduus*, &c.

CAPONNIERE, in Fortification, is a covered Lodgment of about 4 or 5 Foot broad, encompassed with a little Parapet of above two Foot high, which serves to support the diverse Planks laden with Earth.

This Lodgment is large enough to contain 15 or 20 Soldiers, and is usually placed upon the Extremity of the Counterfarp, having sometimes several little Embrasures made therein, commonly called *Mardresses*. They are generally on the Glacis, or in dry Moats.

CARPÆ Saltantes, is the Term for a fiery Meteor or Exhalation which sometimes appears in the Atmosphere, and is not fired in a straight Line, but with Inflexions or Windings in and out.

CAPEOLARIA Vasa, in an Animal Body, are such as twine about like the *Capreoli* or Tendrils of Vines.

CAPREOLUS, in Botany, is the Clasp or Tendril, by which the Vines and such like creeping Plants fasten themselves to those things which are designed to support them.

CAPREOLATÆ Plantæ, are such Plants as turn, wind and climb along the Surface of the Ground, by Means of their *Capreoli* or Tendrils; as *Gourds*, *Melons*, *Cucumbers*, &c.

CAPRICORN, the Goat, one of the Zodiacal Signs marked thus, ♈: Through the first Degree of it, the Southern Tropic, or the Tropic of *Capricorn* passes at 23°. 30'. Distance from the Equator.

CAPSTAN, or as the French write it *Cabestan*, others *Capstaud*, of a Ship, is of two kinds, the Main *Capstan*, and the *Jeer Capstan*.

The Main *Capstan* is that piece of Timber which is placed next behind the Main-Mast, its Foot or lower End standeth in a *Step*, on the lower Deck; and its Head is between the two upper Decks. Its several Parts are thus called; the smallest Part of it the *Spindle*; the Brackets set unto the Body of the *Capstan* close under the *Barrs*, they call the *Whelps*. The main Substance or Post of the whole Piece is the *Barrel*, through which the *Barrs* go. The *Pawl* is a Piece of Iron, bolted to one End of the Beams of the Deck, close to the Body of the *Capstan*; to stop the *Capstan* from turning back; and this Stoppage they call *Pawling the Capstan*. The use of the *Capstan* is to weigh the *Anchors*; to hoise up, or strike down *Top-Matts*; to heave any weighty thing, or to strain any Rope that requireth main force.

The *Jeer Capstan* is placed in the same manner as the Main *Capstan*; between the Main-Mast and the Fore-Mast, and its Use is chiefly to heave upon the *Jeer Rope* (which see) or to heave upon the *Viol*, and to hold off by when the Anchor is weighing.

The Terms belonging to the Use of the *Capstans* are, *Come up Capstan*, that is, slack the Cable which you heave by; in which Sense also they say, *Launch out the Capstan*; *Pawl the Capstan*, is, stop'd it from going back, as was above hinted.

CAPSULA Communis, of *Glisson*, is a Membrane proceeding from the *Peritoneum*, and including both the *Porus Biliaris* and the *Vena Portæ* in the Liver.

CAPSULA Seminalis, in Botany, is the *Cafe* or *Husk* that holds the Seed of any Plant.

CAPSULÆ Atrabilarie, the same with the *Renes Succenturiari*: Which see.

CAPSULÆ Seminales, in Anatomy, are the extreme Cavities of the Vessels which convey the *Semen* in an Animal Body; they are dilated like little Coffers, which by two small Holes emit the *Semen* received from the Testicles into the little Seminary Bladders, that it may either be preserved there against the time of Coition, or be reduced into Blood by the Lymphetick Vessels. *Blanchard*: See *Testes* and *Testicle*.

CAPTION, when a Commission is executed, and the Commissioners Names subscribed, and returned, that is called the *Caption*.

CAPUT Mortuum, is that thick dry Matter that remains after Distillation of any thing, but of Minerals especially; and very commonly it denotes only that which remains of *Vitriol* in its Distillation, which they call *Colcothar Vitrioli*: See *Earth* and *Terra Damnata*. This *Caput Mortuum*, though in some Cases there be but little, if any, Active Principle left in it, yet is never pure, and the *Colcothar Vitrioli*, if exposed to the Air, will turn into *Vitriol* again.

CARAT: A *Carat* of Gold is properly the Weight of 24 Grains or one Scruple; so that 24 Carats make an Ounce.

If an Ounce of Gold be so pure, that in its Purification (with Antimony, or otherwise) it loses nothing at all; 'tis then said to be Gold of 24 *Carats*: If it lose one *Caret*, 'tis then Gold of 23 *Carats*; and if it lose two *Carats* in its Purification, 'tis called Gold of 22 *Carats*, &c. But perhaps there is no such thing as Gold of 24 *Carats*, for it will retain some small Portion of Silver or Copper, putrify it as long as you will.

A *CARAT* of Diamonds, Pearls, or Precious Stones, is the Weight of four Grains only.

CARBUNCULATION, is the blasting of the new sprouted *Buds* of Trees or Plants, either by excessive Heat, whereby the Texture of the Fibres of the Vegetable are so dissolved, that its Pores become wholly changed; or else by excessive Cold, which compresses its Fibres so, that the Pores thereby are shut up, and leave no Passage for the Alimentary Juice.

CARBUNCULUS, the same with *Ambrax*.

CARCUS, is an Iron Case or hollow Capacity about the Bigness of a Bomb, sometimes made all of Iron (except two or three Holes through which the Fire is to blaze) and sometimes made only of Iron Bars or Hoops, and then covered over with Pitched Cloth, Hemp, &c. and filled with several kinds of Materials for firing of Houses: They are thrown out of Mortar-Pieces, like Bombs, into Besieged Places, &c.

CARCINODES, a Tumour resembling a *Cancer*. *Blanchard*.

CARCINOMA, *Carcinus*, or *Cancer*, is a Tumour that arises round, hard, livid, painful; at the Beginning as big as a Pea, but afterwards its surrounded with great swelling Veins, which resemble the Feet of a Crab (though not always) whence the Name. *Blanchard*.

CARD: See *Chard*.

CARDIACA, is a Suffocation of the Heart from a Polypus or coagulated Blood. *Blanchard*.

CARDIADICUM, a *Cordial*, is a Medicine which (as they formerly thought) corroborates the Heart; but it rather only puts the Blood into a fine gentle Fermentation, whereby the Spirits formerly decayed, are repaired and invigorated, so that the Blood, by consequence, circulates more easily and briskly.

CARDIACUS Plexus, is a Branch of the eighth Pair of Nerves of the *Par Vagus*, which about the first or second Rib, is sent from its descending Trunks, and is bestowed upon the Heart and its Appendage.

CARDIALGIA, is a gnawing Pain sometimes felt in the *Scrobiculus Cordis*; or, as *Blanchard* saith.

CARDIALGIA and *Cardiognor*, the Heart-burning, is a Gnawing or Contraction of the Nerve, called *Par Vagus*, and the intercostal implanted in the Stomach, proceeding from a pungent vellicating Matter in the Ventricle; so that the Heart being strained and contracted by Consent with the Stomach, occasions sometimes a Swooning away.

CARDINAL Winds or *Points*, are the South, West, North and East Points of the Compass; and also the Equinoctial and Solstitial Points of the Ecliptick, are called the 4 *Cardinal Points*.

CARDINAL Signs, are those Signs of the Zodiac called *Aries*, *Libra*, *Cancer* and *Capricorn*.

CARDIOGMOS, the same with *Cardialgia*.

CAREEN: A Ship is said to be brought to a *Careen*, when the most Part of her Lading, &c. being taken out, there is laid by her Side another

Ship or Vessel lower than her, unto which she is haled down as low as Occasion requires, as to the 4th or 5th Strake, and there kept by the Weight of Ballast, Ordinance, &c. as well as by Ropes, lest it should strain her Masts too much. 'Tis done with a Design to trim her Sides or Bottom, to caulk her Seams, or to mend any thing that is at fault under Water: And from hence if a Ship lie on one Side when she Sails, they say, *She Sails on the Careen*.

CARIATIDES: See *Caryatides*.

CARIES, is the Corruption of a Bone from the continual Afflux of vicious Humours, or from their Acrimony and Malignity, or from a Bruise that some way affects the Bones, or from sharp Medicines, &c. *Blanchard*.

CARINA, is a Term used both by the Anatomists for the first Rudiments of the entire *Verrebra*, as they appear in a Chicken's Embryo while 'tis in the Shell, because it is crooked in the Form of the Keel of a Ship. And also the Botanists for the same Reason use the Word *Carina*, to express the lower *Petalum* of a *Papilionaceous* Flower. The Leaves also of the *Alphodelus* they say are *Carinated*.

CARLING Knees, are those Timbers which go athwart the Ship, from her Sides to the Hatchway, and which bear up the Deck on both Sides.

CARLINGS, are Timbers in a Ship lying Fore and Aft along, from one Beam to another; on these the Ledges rest, on which the Planks of the Deck are made fast. All the *Carlings* have their Ends let into the Beams, which is called *Culvertail*.

CARMINATIVE Medicines, are Remedies that dispel or discuss Wind, either by appeasing the Fermentations that occasion it, or by making it thin, and opening the Pores that it may be expelled. *Blanchard*.

CARNATION, is a Term in Painting, signifying such Parts of an Human Body as are drawn naked, without any Drapery, or which express the bare Flesh; and when this is done Natural, Bold and Strong, and is well coloured, they say of the Painter, that his *Carnation* is very good.

CARNEL, the Building of Ships first with their Timber and Beams, and after bringing on their Planks, is called *Carnel-Work*, to distinguish it from *Clineb-Work*. Those Vessels also which go with *Mizen-Sails* instead of *Main-Sails*, are by some called *Carnels*.

CARNIVEROUS Animals, are such as feed on Flesh wholly or chiefly.

CARNOSITY, is a more than ordinary Fleishiness in any Part of the Body.

CARNOUS, Flethy; whence the *Membrana carnoſa* or *Panniculus carnosus* takes its Name, which is a Flethy Membrane covering the whole Body.

CARO, the Fleth of an Animal Body, is by Anatomists defined to be a Similar and Fibrous Part, soft and thick: They account it Five-fold; 1. *Muscular*, *Fistular* or *Fibrous*, as is the Substance of the Heart and other Muscles. 2. *Parenchymous*, as the Lungs, Liver and Spleen were thought to be by the Accidents: But since the use of Glasses, 'tis plainly discovered, that there is no such thing as a *Parenchyma*, properly speaking, but that all the *Viscera*, as well as other Parts of the Body, are *Vascular*, and nothing but a *Plexus* or Net-work of small Vessels and Canals. They call the Fleth of the Stomach and Guts. 3. *Viscerous*; and they reckon a Fourth sort, which they call *Glandulous*; as is

that of the Pancreas, the Tonfils, the Breasts, &c. And, 5. They call the Flesh of the Lips, Gums, of the Glans of the Penis, &c. *Spurians*, as being of a different Constitution from all the rest.

CARO, a Botanic Word for the Pulp, Flesh or soft Substance contained within any Plant, or its Fruit, such as the Pulp of *Cassia*, *Tamarinds*, *Prunes*, &c.

CAROTIDES, are Arteries in an Animal Body so called; they spring from the ascending Trunk of the *Aorta* or great Artery at the same Place, nearly where the Subclavian Arteries arise; here the Trunk begins to be divided into two Branches, which are these *Carotides*; they ascend directly upwards (though the Right sometimes arises from the right *Subclavian*) and at their rise are sustained by the *Thymus*; then having bestowed Twigs on the Larynx, Tongue, the Muscles of the *Os Hyoides*, and the adjacent Glands, they pass up on each Side by the Sides of the Wind-Pipe to the *Faucet*, together with the Internal Jugular Vein, and there are subdivided into the *External* and *Internal* Branches.

The *External* is smaller, and is dispersed into all the Muscles of the Cheeks, Forehead, Temples, Lips, and in general, through all the outer Parts of the Head and Face.

The *Internal*, which is larger, sends first some more Twigs to the Larynx, Tongue, and so also to the Glands behind the Ears, and the spongy Parts of the Palate and Nose: Then it entrenches the upper Jaw, and bestows a small slip on the Root of each Tooth (as the *External* did on the Roots of the Teeth of the lower Jaw) whereby sharp Humours flowing in upon them, sometimes cause a very painful Tooth-ach. The remainder of it climbs upon the Skull, being about its *Basis* divided into two Branches; the *left* and hinder whereof having sent one slip to the inner Muscles of the Neck, and another through the Hole of the uppermost *Ventebra* into the Membrane that invests the Spinal Marrow, ascending further, enters the Skull at the Hole by which the sixth Pair of Nerves (commonly called) comes out, and creeping along the *Dura Mater*, ends near its *Sinus* (which yet some say it enters.) The larger Branch, tending upwards, is carried through the bony Channel in the Wedge-like Bone, with a winding Duct to the *Sella Equina*; at whose *Basis*, after it hath sent out a Twig on each Side into the *Dura Mater*, it opens it self into many small Slips, which being interwoven with those of the Cervical Artery (above-mentioned) make the *Rete Mirabile*, which is more observable in Beasts than in Men, yet it is not all spent on the said Slips, but perforating the *Dura Mater*, it enters the *Pia Mater*, with two notable Branches, which being divided into very small Twiggings, are mingled with those of the Cervical Artery, with which they pass out of the Skull, and accompany the Spinal Marrow even to the Loins. Afterwards it sends a small Branch thro' the second Hole of the Wedge-like Bone with the Optick Nerve, out of the Skull to the Eye: And yet still supplying more Twigs to the Substance of the Brain and *Pia Mater*, and being united with some other Twigs of the Cervical Artery, it makes the *Plexus Choroïdes*.

CARPIA, is a Tent that is put into a Wound or Ulcer to cleanse it.

CARPUS, commonly *Brachiale*, the first Part of the Palm of the Hand: *Hesychius* calls it that

Part of the Arm which is betwixt the lowermost Part of the Cubit and the Hand, or the Wrist; it consists of eight small Bones, with which the Cubit is joined to the Hand. *Blanchard*.

CARRIAGE of a great Gun, is the Frame of Timber on which a Piece of Ordnance is laid, fixed and mounted. The common Proportion is $1\frac{1}{2}$ of the Length of the Gun for the Carriage, the Wheels $\frac{1}{2}$ of the Length of the Piece in Height, and 4 times the Diameter of the Bore of the Gun, gives the Depth of the Planks at the Fore-end, in the Middle $3\frac{1}{2}$.

CARTILAGE, is a white Part, drier and harder than a Ligament, and softer than a Bone; it is by some said to be a similar and Spermatick Part, but falsely; for it's no more made of Seed, than any other Parts; it renders Articulation more easy, and defends several Parts from the Injuries from abroad. In aged Persons the Cartilages commonly grow Bony.

They have a Membrane just like the *Periosteum*, and 'tis indeed but a Continuation of it.

CARTOUCHE, the same with Carriage.

CARTRIDGES, or *Carthyages*, are Cases of Paper, or as they now are usually made for the King's Ships, to prevent Danger from Fire in a Gun not well spunged, of Parchment; fitted exactly to the Bore of a Piece of Ordnance, and containing its due Charge of Powder. There are also Tin Cartridges, in which the Paper or Parchment ones are both formed and carried.

CARUNCULÆ *Myrtiformes*, are the Wrinklings of the Orifice of the *Vagina*, or Membranous Inequalities; not to be reckoned in any certain Number, which in Women with Child, and after Child-birth are so obliterated, that they are altogether imperceptible; there are for the most part four of them. *Blanchard*.

CARUNCULÆ *Oculi*, are Glandules placed at each great Corner of the Eye, which separate Moisture for moistening the Eyes, the same with Tears, which afterwards by the *Puncta Lachrymalia*, placed in the Bone of the Nose, are discharged into the Nostrils. These are called *Caruncule Lachrymales* by some.

CARUNCULÆ *Papillares*, are Ten little Bodies that are in the Reins and Kidneys; they are properly little Bundles, which arise from the centring together of a great many small Channels, which the Reins are in a great measure made up of; and those receive the *Serum* from the little *Ductus's*, and convey it into the *Plexis*. *Blanchard*.

CARUS, is a Sleep, wherein the Person affected being pulled, pinched and called, scarce shews any sign of either hearing or feeling; it is without a Fever, greater than a Lethargy, and less than an Apoplexy. *Blanchard*.

CARYATIDES, an Order of Pillars in Architecture, in the Form of the Bodies of Women with their Arms cut off, and clothed in a Garment down to their Feet: These Figures do support the *Entablature*. There are some Columns of this Order in the famous Building at Bourdeaux, called the *Tuelleres*; and in the Great Hall of the *Swiss* Guards at the *Lowre* in *Paris*; where four *Caryatides* support a Gallery enriched with Ornaments very well cut.

The rise of this order of Pillars was this; The Inhabitants of *Carya* in *Peloponnesus* did once treacherously join with the *Persians* against their own Country; but the *Grecians* got the Battle, and put

put all the Male Inhabitants of *Carya* to the Sword, educating the City to Ashes. The Women they took Captives, and carried in Triumph: And the more to perpetuate the Memory of this base Action, they would not permit these Women ever to put off their Triumphal Vêtements; but ordered the Architects of those times to express them in that dress, as supporting the heavy Weight of their Edifices, instead of usual *Columns*.

The *Perfick Order of Pillars* had much the same Original: Which see. *Vitruv. lib. 2. c. 1.*

CASCABELL, is the hindermost round Knob or the utmost part of the Breech of a Piece of Ordnance.

CASCADE, an *Italian* Word, signifying a fall of Water, whether Natural or Artificial.

CASCAN, in Fortification, is a certain Hole or hollow Place in Form of a Well, from whence a Gallery dug in like manner under Ground is convey'd, to give Air to the Enemy's Mine. Some of these *Cascans* are more hollow than others, being usually made in the Retrenchment of the Platform near the Wall.

CASEMATE, in Fortification, sometimes is the Well with its several Subteraneous Branches or Passages dug in the Passage of the Bastion till the Miner is heard at work, and Air given to the Mine.

Also a certain Vault made of Mason's Work, in that Part of the Flank of a Bastion which is next the Curtain, on purpose to fire upon the Enemy, and to defend the Face of the opposite Bastion of the Moat.

Sometimes it consists of 3 Plat-forms one above another, the *Terreplan* of the Bastion being the highest. Behind the Parapet, which fronts along the Line of the Flank, there are Guns placed laden with Cartridges of small Shot to scour along the Ditch; and these are covered from the Enemy's Batteries by Earth-works Faced or Lined with Wall, and are called *Orillons* or *Epaulemens*. This is the best Defence a Place can have.

CASERN, in Fortification, is a little Room, or Lodgment, or Building, erected between the Rampart and the Houses of Fortified Towns, to serve as Apartments or Lodgings for the Soldiers of the Garrison, to ease the Garrison: There are usually 2 Beds in each *Casern* for six Soldiers to lie 3 and 3; but the third part being always on the Guard, there are but 4 left in the *Casern*, 2 in a Bed.

CASE-SHOT, is when Musket-Bullets, Stones, old Pieces of Iron, &c. are put up into Cafes and so shot out of great Guns. 'Tis chiefly used at Sea to clear the Enemy's Decks when they are full of Men.

CASKETS (in a Ship) are small Strings made of Sinnet, and fastened to the upper Part of the Yards in little Rings (which they call *Grommets*.) Their use is to fasten the Sail to its Yard when 'tis to be furl'd up. The biggest and longest of these is in the middle of the Yard, just between *Tyes*, and is called the *Breast Casket*.

CASSIOPEA, or *Cassiopeia*, the Name of one of the Constellations of the fix'd Stars in the Northern Hemisphere, consisting of 25 Stars, and is placed opposite to the *Great Bear* on the other side the *Pole Star*.

CAST a *Point of Traverse*, in Navigation, signifies to prick down on a *Chart* the Point of the Compass any Land bears from you, or to find on what

Point the Ship bears at any instant, or what Way the Ship has made.

CASTOR, a fix'd Star of the second Magnitude in *Gemini*, whose Longitude is 105°. 41'. Latitude 10°, 2'.

CASTOR and *Pollux*, are two *Meteors* which sometimes in a great Storm at Sea appear flicking to some part of the Ship, in the shape of Balls of Fire. Sometimes one is seen and then 'tis call'd *Helena*; both of them are by some call'd *Tyndarides*.

CASTOR and *Pollux*, a Constellation of the fix'd Stars; the same with *Gemini*, being one of the 12 Signs of the *Zodiack*.

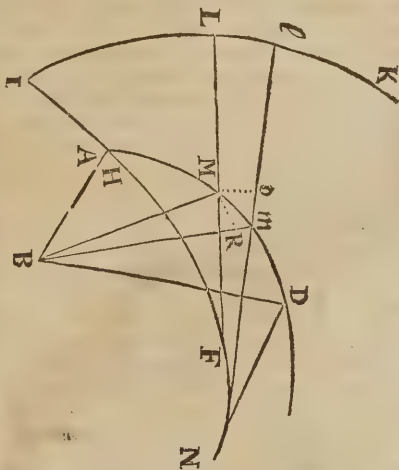
CASU *Consimili*, is a Writ of Entry, granted where the Tenant by Curtesy, or Tenant by term of Life, or for the Life of another, doth alien in Fee, or in Tail, or for the Term of another's Life.

CASU *Proviso*, is a Writ of Entry given by the Statute of *Gloucester*, in case where a Tenant in Dower alieneth in Fee, or for Term of Life, or in Tail, and lieth for him in Reversion against the Alienance.

CATABIBAZON, the *Dragon's Tail* is so call'd because it goes exactly against the *Dragon's Head*.

CATACATHARTICKS, are Medicines that purge downwards.

CATACAUSTICKS, or *Caustick*s by *Reflection*.



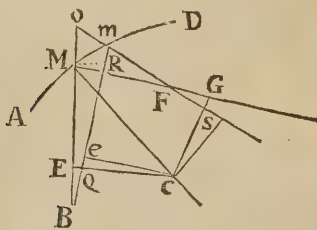
Suppose an infinite number of Rays as *BA*, *BM*, *BD*, proceeding from the radiating Point *B*, and reflected at the Curve *AMD*, so that the Angles of Incidence be still equal to those of Reflection; the Curve *HFN* to which the reflected Rays are Tangents continually (or which continually touches the Productions of them *AH*, *MF*, *DN*) is called the *Caustick* by *Reflection*. Or it will amount to the same thing, if one says, that the *Catacaustick Curve* is that which is formed by joining the Points of Concourse of the several reflected Rays. Let the reflected Ray *HA* be produced to *I*, and take *AI = AB*, and suppose the Curve *ILK* described by the *Evolution* (see the Word *Evolution*) of the *Caustick* *HFN*, beginning at the Point *I*. Again, supposing the incident and reflected Rays *BM*, *MF* infinitely near to the incident and reflected *BM*, *MF*; and drawing out *FM*

to l , on the Centers F, B , let the little Arches MO, MR be described. These things promised, 'tis evident,

1. That the little Triangles MOm, MRm are always similar and equal. For the Angles at O and R are Right ones; and the Angle RmM, FmD are equal from the Supposition of the Angles of Incidence and Reflection, and $FmD = OmM$, as being vertically opposite; and the Hypothenuse Mm is also common to both Triangles: therefore they are similar and equal, and Om always $= Rm$.

2. 'Tis clear that Om is the Increment of LM , and Rm the Increment of BM , and these Increments are perpetually equal to one another. Therefore their respective Sums are so too; but the Sum of all Om (for the Portion AM of the reflecting Curve AMD) is $ML - IA$, and the Sum of all Rm (for the same Portion of the Curve AM) is $BM - BA$, which are therefore equal to one another.

3. From the Nature of Evolution, the Tangent of the *Causlick*, FL is the Portion of the Curve FH the Right-line HI , that is $FM + ML = AH + HF + IA$, and $ML - IA = AH + HF - MF$; but $ML - IA = BM - BA$, and therefore the Portion of the *Causlick* $HF = BM - BA + MF - AH$ perpetually. That is, the Portion of the *Causlick* HF formed from the reflected Rays of the Curve AM , is equal to the Difference of the incident Rays BM, BA , added to the Difference of the reflected Rays $M F, AH$. Or, taking any two incident Rays, as $B A, BM$, that Portion of the *Causlick* which is evolved while the Ray BA approached to a Coincidence with BM , is to the Difference of these Incidents + the Difference of their reflected Rays. Now knowing how to determine the *Evoluta* of any given Curve, the Invention of the *Catacauslick* from thence is easy.



Let the Point C be at the *Evoluta* of the reflecting Curve AMD , or which is all one, let MC be the Radius of the Concavity for the Point M ; and supposing the Arch Mm infinitely small, let Bm, Cm, Fm be drawn. Farther, upon the Centers B, F , let the little Arches MR, MO be described; and from the Point C , the Perpendiculars CE, Cg, CG, Cg , to the incident and reflected Rays. The Triangles MRm, MOm are similar and equal, as was shewn before, and $MR = MO$. Also the Triangles CEM and CGM are similar and equal, and so are Cem and Cgm ; for the Angles at E, e, G, g are right, and MC, mC are common, and $EMC = GMC$, and $emC = gmC$ (because MC, mC are Normals to the Curve by supposition of the *Evoluta*, and the Angles of Incidence and Reflection are equal) therefore CE

$= GC$, and $Ce = gC$, and consequently $CE - Ce = CG - Cg$, that is, $EQ = SG$. Lastly, the Triangles BMR and BEQ are similar, and so are FMO, FGS . Now let $BM = y, ME = MG = a$; therefore $BM + BE = 2y - a$; let $RM = OM = x$, and $FM = z$, wherefore $FG = a - z$, and let it be required to find z , which determines

the Point F in the *Causlick*. Then $EQ = \frac{yx - ax}{y}$, and $EQ + MR = \frac{2yx - ax}{y}$, also $SG = \frac{ax - xz}{z}$,

and $SG + MO = \frac{ax}{z}$. But by what was shewn before $RM = MO$, and $SG = QE$; therefore $EQ + RM = SG + MO$, viz. $\frac{2yx - ax}{y} = \frac{ax}{z}$, and $2yz - za = ya$, and $z (= MF) = \frac{ay}{2y - a}$. *Q. E. I.*

Corol. 1. If the incident Rays are parallel, then $z = \frac{1}{2}a$. For y in this Case is infinite, and therefore $2y - a = 2y$, the Quantity a vanishing if compared with y .

Corol. 2. If the incident Ray BM touches the Curve AMD in M , then $a (= ME)$ is $= 0$; and therefore $z (= MF = 0)$ also: From whence it follows, that the given Curve AMD , and the *Causlick* touch one another at the Point M .

Corol. 3. If the Radius of Concavity MC be $= 0$, then again $a = 0$, and $z = 0$; from whence it follows, that the Curve AMD and the *Causlick* do cut one another at the Point M , and make an Angle equal to the Angle of Incidence.

Corol. 4. If CM be infinite, then $a (= ME)$ is infinite likewise, and $z (= MF) = -y$; and in this Case of the infinite Distance of the Point C , the Arch Mm becomes a Right-line.

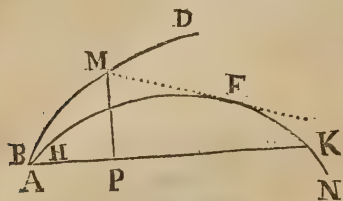
Corol. 5. 'Tis easy to apply all this that has been said, when the Curve AMD is convex to the Radiating Point B (in which Case we shall have $z = \frac{ay}{2y + a}$) and to shew when the reflected Rays will come converging or diverging.

Corol. 6. When the Curve AMD is a Geometrick Curve, the *Causlick* will be so too; for if AMD be a Geometrick Curve, the *Evoluta* will be so too; that is, all the Points c may be Geometrically determined, and from the *Evoluta*, the Points F of the *Causlick* may be Geometrically determined also. But farther, the *Causlick* upon this Supposition shall always be rectifiable too, for Right-lines may always be found equal to any Portions of it.

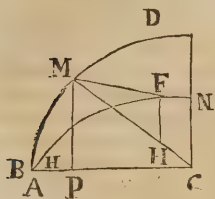
Corol. 7. 'Tis plain, that giving any 2 of the 3 Points B, C, F , that is, the Radiating Point, the Point of the *Evoluta*, and the Point of the *Causlick*, the 3d Point may be determined.

By this general Theorem and its Corollaries, the *Causlicks* of particular Curves are easily determined, however the Rays go, Converging, Diverging or Parallel; but we will suppose the simpler Case of parallel Rays. Thus in the common Parabola, if the incident Rays are parallel, and cut the Ax at Right-angles, that is, are co-incident with the Ordinates to that Ax, then we have $z = \frac{1}{2}a$; so that taking in each reflected Ray the Length of $\frac{1}{2}a$ (a being the reflected Ray intercepted between

tween the Point of Incidence, and the Point where the Normal from the Evoluta meets that reflected Ray) by this Means the several Points of the *Causlick* will be determined. The Length of the *Causlick* Curve also taken from the Vertex of the Parabola (where it begins) to any other Point, is equal to the Sum of the Incident and reflected Rays.



As suppose AMD were the Parabola, whose Vertex A , and Ax AK , and AHF were the *Causlick*, beginning at the same Point; now because the incident and reflected Rays at the Vertex are equal to nothing; that is, $AB=0$, and $AH=0$, therefore the Curve AHF ($=PM-BA+MF-AH$ by what was shewn before) $=PM+MF$.



bisected in H , a perpendicular HF to the reflected Ray MF gives the point F in the *Causlick*. The reflected MF is also equal to $\frac{1}{2}$ the Incident BM perpetually; for MC being $=r$, and $MP=y$, we have from the similar Triangles MPC , MFH ,

$$r:y::z:y. \text{ From hence 'tis clear, that}$$

the *Causlick* terminates at the point K , bisecting the Radius CB at Right Angles to AC . Again, the Portion of the *Causlick* $AF=3MF$, because $AF=PM+MF=y+z=y+\frac{1}{2}y$. But these hints of Examples may suffice, without descending to those of other Curves, which are to be done after the same manner from the general Theorems that these were, and the Constructions likewise to be deduced. 'Twould be no difficult matter to shew also what Curves these *Causlicks* are in every Example: As in the last case of the Circle, that the *Causlick* is a Cycloid formed by the Revolution of the Circle describ'd upon the Diameter HM , along the Quadrant describ'd with the Radius CH . That the *Causlick* of the vulgar Semi-cycloid when the Rays are parallel to the Ax of it, is also a vulgar Cycloid, describ'd by the Revolution of a Circle upon the same Base. That the *Causlick* of a Logarithm Spiral, is the same Curve, but only set in a different Position; and the like others.

CATACHRESIS, is a Trope in Rhetorick, by which Liberty is given to borrow the Name of a thing, though quite contrary to what it should be, because it cannot be otherways Express'd; as when we say a Silver Ink-horn; here Reason demurs at

the Expression; yet Necessity obliges us to make use of it. But perhaps *Ink-horn* is corrupted from *Inkern* or *Inker*.

CATACALIDA, is the Rib called the Subclavian. CATACousticks, or Cataphonicks, is the Science of Reflected Sounds, or which teaches the Doctrine and Properties of Echoes.

CATADIOPTRICAL Telescope, or Reflecting Telescope: See Telescope.

CATAGMA, is a breaking of Bones, or a Separation of the Continuum in the hard parts of the Body; which is affected with some hard Instrument forcibly impressed upon the part; whose Differences are taken from the Form, the Part, and several Accidents. Blanchard.

CATAGMATIC Medicines, are such as are used to help to Consolidate Broken Bones.

CATALEPSIS, or Catobus, is a Disease almost like an Apoplexy, being an Abolition of all the Animal Functions; except that the Respiration remains entire, and the Patient preserves the same Habit of Body that he had before he fell sick. Blanchard.

CATALEPTICK Verse: See Disposition.

CATALLIS Captis, Nomine Distributionis, is a Writ that lieth within a Borough, or within a House, for Rent going out of the same, and warranteth a Man to take the Doors, Windows, or Gates for Rent.

CATALLIS Reddendis, is a Writ which lyeth where Goods being delivered by any Man to keep unto a certain Day, and be not upon demand delivered at a Day; and is otherwise called, a Writ of detinue.

CATAPASMA, a fragrant Powder which is sometimes applied to the Scrobiculum Cordis, to strengthen the Stomach.

CATAPHORA, is the same with Coma; they only differ in this, that Cataphora is taken as the Genus to all sorts of Stupors that are not attended with a Fever. Blanchard.

CATAPLASM, is a topical Medicine of the consistence of a Pultise; it is usually describ'd two ways, either boiled, or without it; the former is more frequent, the latter of more efficacy: In the former, they are to take such Vegetables as are proper, as Roots, Herbs, Seeds, Flowers, Fruits, &c. adding proper Meals, or omitting them; all which are boiled up in a convenient quantity of Liquor, v.g. Water, Beer, Milk, Honey, &c. to the consistence of a Pultise: The latter is prepared commonly of Vegetables shred small with the infusion of so much Liquor only as may make it of the former Consistence. You may add here Meal, Crums of Bread, Oyls, Ointments, as in the former sort of Cataplasms. Blanchard.

CATAPTOISIS, is one Symptom of an Epilepsie, when Men fall suddenly to the Ground. Blanchard.

CATARACT, a Disease in the Eyes, and is twofold, either beginning, as a Suffusion only, or confirmed, as a Cataract, proper so call'd; the Incipient is but a Suffusion of the Eye when little Clouds, Motes, and Flies seem to fly before the Eyes; but the confirmed Cataract, is when the Pupil of the Eye is either wholly or in part covered, and shut up with a little thin Skin; so that the Sun-beams have not due admittance to the Eye. Blanchard.

CATARACT, is a Precipice in the Channel of a River, caused by Rocks, or other Obstacle stopping the Course of its Stream, from whence the Water falls with a great noise and impetuosity;

as the *Cataracts* of Nile, Danube, Rhine, &c.

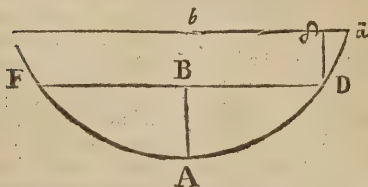
CATARRHUS, is a Defluxion of Humours from the Head towards the Parts under it, as the Nostrils, Mouth, Lungs, &c. Some distinguish it by the Name of *Loryza*, when it falls on the Nostrils, by that of *Bronchus* when on the Jaws; and by the Word *Rhume*, when it falls on the Breast.

CATCHES, are those parts of a Clock that hold by hooking and catching hold of.

CATEGORIA and } the same with *Predicamen-*
CATEGREMA } *tum* in Logick: See *Predicament*.

CATENARIA, is the Curve Line which a Rope hanging freely between two Points of Suspension forms it self into. What the Nature of this Curve is, was enquired amongst the Geometers in *Galileus's* time, but I don't find any thing was done towards a Discovery till in the Year 1690, *James Bernoulli* published it as a Problem; which, about two Months after, *Leibnitz* declared he had found out, and would communicate within the Year: In December, 1690, *John* the Brother of *James Bernoulli* communicated an Investigation of it to the Editors of the *Acta Eruditorum*, which was publish'd afterwards June 1691: This *Catenary* or *Funicular* he saith he found not to be truly Geometrical, but of the Mechanical Kind, because its Nature cannot be expressed by a determinate Algebraick Equation; but *Leibnitz* gives its Construction Geometrically. In the Year 1697, the Month of August, Dr. *Gregory* published a Method of Investigation of the former and some other new Properties of this Curve which you will find there, from whence this Method of finding the general Property of the *Catenaria* is taken.

1. Suppose a Line heavy and flexible, the two Extrems of which I call *D* and *E* firmly fixed in those Points; by its weight it is bent into a certain Curve *FAD*, which is call'd the *Catenaria*.



2. Let *BD* and *bd* be parallel to the Horizon, *AB* perpendicular to *BD*, and *Dd* parallel to *AB*, and the Points *Bb* infinitely near to each other. From the Laws of Mechanicks any 3 Powers in *Aequilibrio* are to one another, as the Lines parallel to the Lines of their direction (or inclined in any given Angle) and terminated by their mutual Concourses. Hence if *Dd* expresses the absolute Gravity of the Particle *Dd* (as it will if we allow the Chain to be every way uniform) then *Dd* will express that Part of the Gravity that acts perpendicularly upon *Dd*, and by the Means of which this Particle endeavours to reduce it self to a Vertical Position; so that if this Lineola *d* be constant, the perpendicular Action of Gravity upon the Parts of the Chain will be constant too, and may therefore be expressed by any given Right Line *a*. Father, the Lineola *Dd* will express the Force which acts against that *Conatus* of the Particle *Dd* by which it endeavours to restore it self into a Position perpendicular to the Horizon) and hinders it from doing so: This Force proceeds

from the ponerous Line *DA* drawing according to the Direction *Dd*: and is (*ceteris paribus*) proportional to the Line *DA*, which is the Cause of it. Supposing the Curve *FAD*; therefore as before, whose Vertex (the lowest Point of the *Catena*) *A*, *ax* is *AB*, Ordinate *BD*, Fluxion of the Ax *Dd*=*Bb*, Fluxion of the Ordinate *dd*, the Relation of these two Fluxions is thus, viz. *d* *d* : *Dd* :: *a* : *DA* Curve; which is the Fundamental Property of the Curve, and may be thus expressed (putting *AB*=*x*, and *BD*=*y*, and *AD*=*c*)

$$\frac{y}{x} = \frac{c}{a}$$

CATHARPINGS, are small Ropes in a Ship running in little Blocks from one Side of the Shrouds to the other near the Deck, they belong only to the Main-Shrouds and Fore-Shrouds: Their use is to force the Shrouds taught, for the ease and safety of the Masts when the Ship rolls; they are also at the setting on of the Puttocks of the Shrouds, but there they do not run in Blocks, but are made fast.

CATHARTICK, is a purging Medicine which cleanses the Stomach, the Guts, and whatsoever is vitious and heterogeneous in the Blood, and throws it into the Common-Shore of the Guts. *Blanchard*. See *Purgatio* & *Vomitorium*.

CATHEMERINA Febris, the same with a *Quotidian*.

CATHETER, is a Fistulous Instrument which is thrust up the Yard into the Bladder, to provoke Urine when its suppressed by the Stone; or into whose Cavity an Instrument called *Itinerarium* is thrust to find out the Stone in the Bladder, that then the *Sphincter* of the Bladder may be shewn, and an Incision be made in the *Perineum*.

CATHETERISMUS, is the Administration or Operation of injecting any thing into the Bladder be a *Catheter* or a *Syringe*.

CATHETI, in a Right-angled Triangle, and the Sides including the Right-angle. If it be in the Singular Number, *Cathetus*.

CATHETUS, it signifies the Perpendicular only, the other Leg being called the Base. Also *Cathetus*, in *Catoptricks*, signifies a Line drawn from the Point of Reflection perpendicular to the Plane of the Glass.

CATHETUS, in Architecture, is taken for a Line supposed directly to traverse the Middle of a Cylindrical Body, as of a *Ballister* or Column. In the *Ionick* Chapter it is also a Line falling perpendicularly, and passing through the Center or Eye of the *Voluta*.

CATHETUS of Incidence, is a Right Line drawn from a Point of the Object, perpendicular to the Reflecting Line.

CATHETUS of Reflection, or *Cathetus of the Eye*, is a Right Line drawn from the Eye perpendicular to the Reflecting Line.

CATHYPNIA, a deep or profound Sleep; such as Men are in by taking Opitates, or by Lethargy, &c.

CATO-CATHARTICK Medicines, are such as work downwards, and purge by Stool only: These are called also *Catoreticks*.

CATOCHE, the same with *Catalepsis*.

CATOPSIS, the same with *Myopia*.

CATOPTRICKS, is that Part of the Science of Opticks which treats of *Reflex-vision*, and explains the

the Laws and Properties of *Reflexion*.

CATORETICKS, the same with *Cathersticks*.

CATT, or *Catt-Head*, a large piece of Timber so called in a Ship; 'tis fastened aloft over the *Hawse*, having at one end two *Shivers*, in which is reeved a Rope with a Block, and at the end of the Rope a large Hook, which is called the *Catt-Hook*: Its Use is to trife up the Anchor from the *Hawse* to the Top of the *Fore-Cuffle*, where there is fastened a *Stopper* (i. e. a piece of Rope spliced into it) at the Anchor, which serves to hitch the Hook of this *Catt-Rope* into the Ring of the Anchor.

CATT-HOLES, in a Ship, are Holes in her Stern above the Gun-Room Port, and through them, by means of a *Stem-fift* (that is, some Fastenings behind the Stern) to which a *Cable* or *Hawser* is brought, a Ship (upon Occasion) is heaved a Stern.

CAVALIER, in Fortification is a Heap or Mafs of Earth raised in a Fortrefs, to lodge the Cannon for scouring the Field, or opposing a Commanding Work. These *Cavaliers* are sometimes of a Round, sometimes of a Square Figure, the Top being bordered with a Parapet to cover the Cannon there-in mounted. There must be 12 Foot between Cannon and Cannon; and if they are raised on the Enclosure of any Place, whether in the Middle of the Curtin, or in the Gorge or Bastion, are generally 15 or 18 Foot high above the Terre-plan of the Rampart.

A *Cavalier* is sometimes called a *Double Bastion*, and is designed to overlook the Enemy's Batteries, and to scour their Trenches.

CAVA VENA; the greatest Vein in the Body descends from the Heart; so called from its great Cavity, and into it, as into a common Channel, do all the lesser Veins, except the *Pulmonary*, empty themselves. Its Root may very properly be said to be in the Liver; for by its Capillaries it receives the Blood that is transcolated through the Glandulous *Parenchyma* of the Liver, from the Capillaries of the *Porta*, and by its ascending Trunk conveys it to the Heart. These Capillaries emptying all the Blood exhausted out of the Liver into the *Cava*, it is presently divided into the *Ascending* and *Descending Trunk*. The *Ascending* enters the *Diaphragm* and goes to the *Thorax*. The *Descending Trunk* is somewhat narrower than the *Ascending*, and passes down along with the great Artery, continuing undivided till the fourth *Vertebra* of the Loins. But in the mean time sends forth divers Branches from its Trunk, as the *Vene Adipose*, *Emulgents*, *Spermaticks*, *Lumbares*; All these Veins being sent forth of the Trunk, by the time it is come to the fourth *Vertebra* of the Loins where it turns to behind the *Arteria Magna*, above or before which it had thus descended, and is then divided into equal Branches, called *Iliaci*, because they pass over the *Os Ilium*, &c. as they go down to the Thighs.

This Vein carries nothing to the Liver, but receives the Blood from thence, carrying it, and what it receives from its other Branches into the Right Ventricle of the Heart, that it may be there anewwipproved and inspirited.

CAUDA Lucida, the *Lion's Tail*, a fixed Star of the first Magnitude, whose Longitude is 167° 53'. Latitude 12°. 16'. Right Ascension 173°. 9'.

CAVIN, in Fortification, is a hollow Place proper to favour the Approaches to a Fortrefs, so that

one may advance therein under Covert towards the Enemy's, as it were in a Trench. If it be with-in Musket-shot, 'tis a Place of Arms ready made to Hand; and a Convenience for opening the Trenches out of Fear of the Enemy's Shot.

CAULEDON, is the breaking of Bones across, when the Parts of the Bones are so separate that they will not lye direct.

CAULIFEROUS Herbs or Plants, amongst the Botanists, are such as have a true *Caulis* or Stalk, as a great many have not.

CAULIS, is in Botany, the Stalk of any Herb, or the Stem or Trunk of a Tree.

CAUSA Matrimonii prelocuti, is a Writ which lieth in Case where a Woman giveth Lands to a Man in Fee-simple, to the Intent he shall Marry her, and refuseth so to do in reasonable time, being required thereunto by the Woman.

CAUSAL Propositions, are those that contain two Propositions joined together by Conjunction of the Cause (because, or to the end that) as, *Woe to the Rich, because they have their Felicity in this World. The Wicked are advanced, to the end, that falling from on high, their fall may be the greater.*

CASUALTY, is the Action or Power of a Cause in producing its Effect.

CAUSAM nobis significes, is a Writ which lyeth to the Mayor of the Town, or City, &c. that formerly by the King's Writ, being commanded to give Seisin unto the King's Grantee of any Lands or Tenements, doth delay so to do, willing him to shew Cause why he so delayeth the Performance of his Charge.

CAUSODES, the same with *Causus*: Which see.

CAUSTICK Curves: See *Cata-causticks* and *Dia-causticks*.

CAUSTICK Stones or Cauteries, are thus made of Lime and Gravelled Ashes: Put into a large Earthen Pan one Part of Quick-line, and two of Gravelled Ashes, or of Calcined Tartar, both powdered and mix'd; on these pour good store of hot Water, and then leave the Matter to infuse 5 or 6 Hours, then boil it a little: Then filtrate through Cap-paper, and evaporating the Liquor that passed the Filtre, a Salt will remain at the Bottom. Put this Salt into a Crucible, and melt and boil it till all the Humidity which came from the Water is exhausted. The Matter will still remain fluid; and when by trying some of it on the End of a Spatula, you find it of a due Consistence and that it looks like Oil in the Bottom of the Crucible, cast it into a Bason, and cut it, and form it into Pieces while it is warm; put them quickly into a strong Glass Bottle, with a ground Stopple of the same Metal, for they will dissolve and be spoiled if the Air come to them. These are the strongest *Cauteries* that can be made, and are soon and easily prepared.

CAUSTICKS, or *Escharoticks*, are those things which burn the Skin and Flesh into an hard Cruft, as burned Brass, unquenched Lime, sublimated Mercury, and hot Iron, &c.

CAUSUS, or a burning Fever, is that which is attended with a greater Heat than other continued Fevers, an intolerable Thirst, and other Symptoms, which argue an extraordinary Accension of the Blood. *Blanchard.*

CAUTERISATION, is an Artificial Burning made by a *Cautery*.

CAUTERIUM, is a Chyrurgeon's Instrument made of Iron, Silver or Gold, which after it's heated, has an actual Power of Burning into any thing; they differ in Bulk and Form.

It is sometimes taken for a *Potential Caustery*, prepared of *Lixiviums*, or Lime and Soap.

CAUTIONE *Admirtenda*, is a Writ that lieth against a Bishop holding an Excommunicate Person in Prison for his Contempt, notwithstanding that he offereth sufficient Caution or Pledge to obey the Commandments and Orders of the Holy Church from henceforth.

CAZEMATE, a Term in Fortification: See *Casemate*.

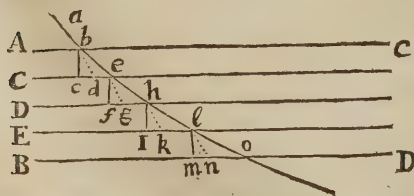
CEGINUS, a fixed Star of the 3 Magnitude in the left Shoulder of Bootes, whose *Longitude* is $194^{\circ}. 5'$. *Latitude* $49^{\circ}. 33'$. *Right Ascension* $215^{\circ}. 39'$. *Declination* $29^{\circ}. 27'$.

39'. Declination $29^{\circ}. 27'$.
CELE, is a Tumour or Swelling in any Part of
the Body.

CELERITY, is the Velocity or Swiftneſs of any Body in Motion; and it is defined to be an Affection of Motion by which any Moveable runs through a given Space in a given Time.

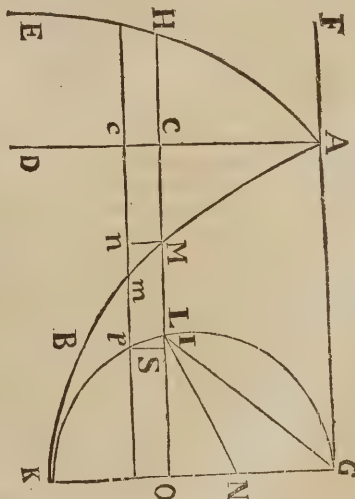
through a given Space in a given Time.

CELERRIMI *Descensus Linea*, the Curve of the swiftest Descent of any Body; or that in which an heavy Body descending by its own Gravity should move from one given Point to another in the shortest Time. This was proposed as a Problem by that excellent Mathematician M. *John Bernoulli*, Professor of Mathematics at *Groningen*; and he did afterwards shew that this Curve was the same with that which a Ray or Particle of Light describes in *Mediums* which are not uniform; for in such a Rarity effects the Ray after the same manner, as the Acceleration of Velocity doth the heavy Body in its Descent. For if any heavy Body descend from any given Point, and describe a Curve, and hath its Velocity in a Subduplicate Ratio of the Altitude: And if a Particle of Light coming from a given Point, and pass through a *Medium* whose Rarity increases in a Subduplicate Ratio of the Altitude or Depth, then will the Velocity of the Particle or Ray of Light, be in a Subduplicate Ratio of such Height or Depth; and consequently, since the Velocity becomes the same whether produced by the uniform Action of Gravity, or by the Rarity of the *Medium*, the Line of Descent or Motion, or the Curve described will be in both Cases the same. There have been published many Methods of Investigating the Nature of this Curve; and the following one (which is short, plain and easy) recommends it self to us with this Advantage, that two Noble Problems in two distinct Sciences, are solved at one and the same time, the one an Optical one, the other a Mechanical.



Let us imagine the Medium $ABCD$ to be made up of Fluids of several different Degrees of Denfities, but the Denfities (proceeding through

the several Intervals of the Parallels AC, Ce, Dh, Eh, Bo , to encrease or diminish in a certain Law. In this Example we'll suppose the Degrees of Rarity in the Fluids to encrease as we go from A towards B ; so that the Ray ab is turned by the Refraction into be , and be into eh , and eh into bl , &c. from the Perpendicular bc, ef, hi , &c. at the Points of Incidence, b, e, h , &c. the prick'd Lines being the several Incident Rays produced. The refracted Ray intercepted between the Points b and o , viz. $b e b l o$, is a Polygon made up of all the Refracted Rays $be, eh, h, &c.$ which defect from one another by the Angles of Refraction made at the several Points b, e, h , &c. Now if the Distances of the Parallels are less'd infinitely, the Polygon $b e b l o$ becomes a Curve Line; but also the Curve Ray in its Passage through the several Mediums, is supposed to take such a Course, that it comes from the Radiating Point to the Point to be enlighten'd in the shortest time, 'tis evident (since 'tis every where so throughout the Polygon $b e b l o$) that the Curve into which that Polygon degenerates (being the Curve which the Ray by the continual Refraction is bent into) is the Curve of swiftest Motion, or that by which the Light passes from the Point b to the Point o in the shortest Time. And since the Sines of the refracted Angles $c b e, f e h$, &c. are still as the Rarities of the Mediums in those several Points, that is, as the Velocities of the Globule of Light in those Places; and since also those refracted Angles are the Angles of the Inclination of the Lines be, eh , &c. to the Perpendiculars bc, ef , &c. 'tis clear that the Curve must have this Property, that the Lines of the Inclinations to a Perpendicular must be every where in the Ratio of the Celerities.



Now let the Law of the Rarity or Density of the Medium be what it will, we may thus in general proceed to determine the Curve. Let the Medium $FGDK$ be determined by the Horizontal Line FG to which AD is perpendicular, and is the Ax of the Curve AHE , whose Ordinate is HC ; and let the Ordinate HC still represent the Rarities of the Medium in the Depths AC , or which is all one, the Velocities of the Globule of Light in the Points of the Curve M . The incurv-

ved Ray, or the *Semeta* of the Globule is the Curve AMB , the Nature of which is to be enquired into. The Lines HCM and cnm are parallel to FG , and Mn parallel to AD . Let $AC =$

x , $Cc = Mn = xCM = y$, $nm = \dot{y}$, $AM = z$,

$Mm = z$, $HC = v$, and aa a stable quantity taken at Liberty. If we put Mm for Radius, 'tis plain that nm is the Sine of the refracted Angle (or of the Curve's Inclination to the Vertical Line Mn at the Point M) therefore since the Sines of those Angles are (as was said before) always as the Celerities, then $\frac{nm}{HC}$ is a constant Ratio, that

is, $\frac{\dot{y}}{v}$ is a constant Ratio; so that $\frac{\dot{y}}{v} = \frac{z}{a}$ (for the

Fluxions z being taken equal, as they may then

$\frac{z}{a}$ is also a stable Ratio) and $a\dot{y} = v\dot{x}$, and $a\dot{y}\dot{y} = v\dot{v}\dot{z}$, but $z\dot{z} = \dot{y}\dot{y} + \dot{x}\dot{x}$ therefore $a\dot{y}\dot{y}$

$v\dot{v}\dot{y} + v\dot{v}\dot{x}$, and $\dot{y} = \frac{a\dot{x}}{aa - v\dot{v}}$, which is

the general Equation in Fluxions for the Curve AMB . Now 'tis all one whether we consider the Increments of the Velocity as depending upon the Medium more or less resisting the Globule, or whether abstracting from all Consideration of a Medium, we suppose them to be the Effects of another Cause, but acting according to the same Law that was observed on the former, since on both Sides the Curve is supposed to be run in the shortest Time. Now if we imagine the Globule to be a heavy Body, and Gravity to be the Cause of the Acceleration; then the Curve AHE will be the common Parabola, since HC or v represents the Celerity for the Space x or AC ; and in this Curve v is as x^2 . The constant Line a being the Parameter, and so $v = \sqrt{ax}$; substituting this in the Room of v in the general Equation, we have

$y = \sqrt{\frac{x}{a-x}} \times x$. From hence it follows, that

the Curve of swiftest Descent, viz. AMD , is the vulgar Cycloid, the Diameter of whose generating Circle GLK is $= a$, and whose Base is AG , and Vertex K , GK being Perpendicular to AG . Two things set this in the clearest Light: 1. To prove that CM is $= arcGL - LO$; And 2, from thence that ML is $= arcLK$, which is the known Property of the Cycloid. That $CM = arcGL - LO$ is certain, in that the Fluxions of them are perpetually equal in all Points of the Curve. Let $LO = s$, and the $arcGL = c$, and its Fluxion $L\dot{p} = \dot{c}$; then since $s = ax - x\dot{x}$, we

have $\dot{s} = \frac{a\dot{x} - 2x\dot{x}}{2ax - x\dot{x}^2}$. Again, $\dot{c} = \frac{\frac{1}{2}a\dot{x}}{s} = \frac{a\dot{x}}{2s}$

$= \frac{a\dot{x}}{2ax - x\dot{x}^2} \frac{1}{2}$; therefore $\dot{c} - \dot{s} = \frac{2x\dot{x}}{2ax - x\dot{x}^2}$

$= \frac{x\dot{x}}{ax - x\dot{x}^2} = \sqrt{\frac{x}{a-x}} \times \dot{x} = \dot{y}$, wherefore

$c = s + y$, and $c - s = y$, viz. $CM = Arch GL -$

LO . Now if $CM = GL - LO$, then MO , which is $= CO - CM$, is $= CO - GL = LO$: But $CO = \frac{1}{2}$ Circle $GLK = GL + LK$; therefore MO , which is $= CO - GL + LO$, is $= GL + LK - GL + LO$; that is, MO is $= LK + LO$, and taking away LO , $ML = LK$: So that 'tis clear the Curve is the Cycloid above described. Q. E. I.

CELESTIAL Globe: See Globe.

CELLULÆ *Intestini Coli*; the little Cavities of the Gut Colon, are where the Excrements lodge some while, that they may refresh some adjacent Part with their Heat, and digest and ferment any Crudities. Blanchard.

CEMENT, is both the Name of a Past with which Plates of Gold being stratified are purified, and according to Helmont and many others, is any Lute by which the Necks of Vessels in Distillation are joined, or as we commonly say, cemented together. And also Cement is the same as,

CEMENTATION, which is one of the Ways of purifying of Gold, and as some say, of Silver; and 'tis thus done, Stratify in a Crucible thin Plates of Gold and Cement, i.e. the Past of that Name which is made of one Part of *Sal Armoniac*, two Parts of *Sal Gemme*, and four Parts of Potter's Earth or powder'd Brick, and covering the Crucible, make a violent Fire round about it, to calcine the Matter for 10 or 12 Hours, that the corroding Salts may carry off the Impurities of the Gold. But this Purification is by no means so good as that made with *Antimony* (which see under the Word *Purification*) for these Salts do sometimes leave other Metals remaining with the Gold, and besides, do often eat away the very Gold it self.

CENCHRIAS, is a sort of spreading Inflammation, running like Wild-fire; called also *Herpes Miliaris*, from the Resemblance it bears to the Seed of the small Grain called *Millet* or *Hyrse*. Blanchard.

CENCRIAS, a spreading Ulcer, the same with *Harpes Miliaris*.

CENEANGIA, is, with some, the same as *Phlebotomy* or Blood-letting.

CENTAURE, a Southern Constellation, consisting of 40 Stars.

CENTESM, is the Hundredth Part of any thing, and is commonly mention'd in our new Decimal Divisions of Degrees, Feet, &c.

CENTRAL-RULE, is a Rule found out and established by our Famous Mr. Tho. Baker, late Rector of *Nympton in Com. Devon*. whereby he finds the Center of a Circle designed to cut the Parabola in as many Points as an Equation to be constructed hath real Root. How by this Means he constructed all Equations as far as Biquadratics, you will find under the Word *Construction of Equations*: And the Demonstration of his Central Rule, I give here by it self.

The Rules of Mr. Baker are these,

$$1. \frac{L}{2} + \frac{q}{8L} = b = CD.$$

$$2. \frac{p}{4} + \frac{ppp}{6LL} + \frac{pq}{4LL} + \frac{r}{2LL} = d = DE.$$

Or by Contraffaction, because $L = 1$, as is supposed, to avoid Fractions,

thro' the *Vertex* of any *Diameter*; that is, by Position of the given *Center*; And Application of this new Property, (That the *Rectangle* made of the *Parameter* and *Difference* of the *Abscissa*, is equal to the *Rectangle* made of the *Sum* of the two *Ordinates* into their *Differences* (to express the *Ratio* of the *Radius* to the given *Line* of the *Parabola*; so having an *Equation* of four *Dimensions*, and rejecting the *Equals* on both *Sides*, he depresses it to a *Cubic*; but adjoining to it a *Quantity* for the *Homogeneous Comparisons*, thereby making the *Whole* equal to nothing, the *Equation* subsists in a *Biquadratic*, having all its *Terms*: If the *Circle* be supposed to pass not thro' the *Vertex* of the *Diameter*, but thro' a *Point*, which being joined with the *Vertex* and the *Center*, may terminate a *Right-angled Triangle*.

This *Equation* he compares with another like it, and equal to it; then by equating the *Co-efficients* of these two *Equations*, he presently discovers the *Central Rule*; whose universal Extent appears in *Biquadratic Equations*, affected under all *Parabolic Degrees*; for all the other *Cases* where any other *Terms* are wanting, are but *Corollaries*, or more compendious *Constructions* derived from the general *Rule*. So that the *Invention* of the *Rule* seems as much due to the last *Equation* of the *Co-efficient*, as to the *aforesaid Properties*, which is demonstrated by *Archimedes* in the *Section* of a *Parabolick Conoid* by a *Plane* parallel to the *Axis*, and is particularly used by *Slusius* in his *Analyticks*, who thereby constructs a *Biquadratic Equation*, keeping all its *Terms*. But then the *Analysis* of *Slusius* by breaking the *Equation* into two others to find two *Places*, is very different from that whereby our *Author* found his *Central Rule*; than which nothing can be expected more easy, simple or universal, seeing any *Parabola* being once for all described, will give all the *Roots*, true or false, of any *Equation*, without *Reduction* or any *Alteration* whatsoever.

CENTRE of a *Circle*, or of a *Sphere*, is that *Point* from whence all *Right Lines* drawn to the *Circumference* or *Surface* are equal. To find the *Centre* of a *Circle*, see *Chord*.

CENTRE of a *Dial*, is that *Point* where the *Axis* of the *World* intersects the *Plane* of the *Dial*; and from thence, in those *Dials* that have *Centres*, all the *Hour-Lines* are drawn. If the *Plane* of the *Dial* be parallel to the *Axis* of the *World*, it can have no *Centre* at all, but all the *Hour-Lines* will be parallel to the *Style*, and to one another.

CENTRE of an *Ellipsis* or *Oval*, is that *Point* where the two *Diameters*, the *Transverse* and the *Conjugate* intersect each other.

CENTRE of the *Equant*, in *Astronomy*, is a *Point* in the *Line* of the *Aphelion*, being exactly distant so far from the *Centre* of the *Eccentrique* towards the *Aphelion*, as the *Sun* is from the *Centre* of the *Eccentrique* towards the *Perihelion*.

CENTRE of *Gravity*, of any *Body*, is a *Point* on which a *Body* being supported, or from it suspended, all its *Parts* will be in *Equilibrio* to one another.

CENTRE (common) of the *Gravity* of two *Bodies*, is a *Point* in a *Right-line* connecting their *Centres*; and so posited in that *Line*, that their *distances* from it shall be reciprocally as the *weight* of these *Bodies*: And if another *Body* be placed in the same *Right-line*, so that its *distance* from a

ny *Point* in it be reciprocally as the *weight* of both the former *Bodies* taken together, that *Point* shall be the common *Centre* of *Gravity* of all 3, &c.

CENTRE of heavy *Bodies*, is in our *Globe* the same as the *Centre* of the *Earth*, towards which all heavy *Bodies* do as it were naturally tend.

CENTRE of an *Hyperbola*, is a *Point* in the middle of the *Transverse Axis*; and consequently, is without the *Figure*, and common to the opposite *Section*.

CENTRE of *Magnitude*, of any *Body*, is that *Point* which is equally remote from its extreme *Parts*.

CENTRE of *Motion*, of any *Body*, is that *Point* about which any *Body* moves when fastened any way to it, or made to revolve round it.

CENTRE of *Oscillation*, see *Oscillation*.

CENTRE of a *Regular Polygon* or *Regular Body*, is the same with that of the inscribed *Circle* or *Sphere*.

CENTRIFUGAL Force, is that *Force* by which all *Bodies* which move round any other *Body* in a *Circle* or an *Ellipsis* do endeavour to fly off from the *Axis* of their *Motion* in a *Tangent* to the *Periphery* of it. And this *Force*, as *Mr. Hugen* demonstrates is always proportional to the *Circumference* of the *Curve* in which the *Revolving Body* is carried round.

The *Centrifugal Force* of any *Body* to the *Centripetal*, is as the *Square* of the *Arch* which the *Body* describes in a given *Time*, divided by the *Diameter*, to the *Space* thro' which an heavy *Body* moves in falling from a *Place* where it was at rest in the same *time*.

If any *Body* swim in a *Medium* heavier than it self, (and in one lighter it cannot do so) the *Centrifugal Force* is the difference between the *Specifick Weight* of the *Medium* and the *Floating Body*.

What the *Centrifugal Force* in the *Planets* is, or the *Conatus Recedendi ab Axe motus*, the endeavour to recede from the *Axis* of the *Motion*; you will find explained under *Planets*; where the *Reason* of all their *Motion* is expounded.

CENTRIPETAL Force, is that *Force* by which any *Body* moving round another is drawn down, or tends towards the *Centre* of its *Orbit*; and is much the same with *Gravity*: See *Vis Centripeta*.

If a *Body*, being specifically heavier than any *Medium*, sinks in it, the excess of that *Body's Gravity* above the *Gravity* of the *Medium*, is the *Centripetal Force* of the *Body* downwards.

CENTROBARYCAL, is what relates to the *Centre* of *Gravity*.

CEPHALA, is an obstinate *Head-ach*.

CEPHALÆA, an old obstinate *Head-ach*.

CEPHALALGIA signifies in general, any pain of the *Head*, but is more especially taken for a new *Head-ach*.

CEPHALALGICA are *Medicines* which purge the *Head*. *Blanchard*.

CEPHALICA, a *Vein* which creeps along the *Arm*, between the *Skin* and the *Muscles*; it divides into two *Branches*. The *External Branch* goes down to the *Wrist*, where it joins the *Basilica*, and turns up the *Back* of the *Hand*, where it gives a *Branch* which makes the *Salvirella*, between the *Ring-finger* and the *Little-finger*. The *Ancients* used to open this *Vein* in *Diseases* of the *Head*, but since the knowledge of the *Circulation* of the *Blood*, there is no difference whether one be blooded in the *Cephalica*, *Mediana* or *Basilica*.

CEPHALICK Medicines, are Spirituous and Volatile ones, used in Distempers of the Head. Also the outermost Vein in the Arm is called *Cephalica*, because it used formerly to be opened in Diseases of the Head rather than any other.

CEPHALOPHARYNGÆI, signifies the first Pair of Muscles of the upper Part of the Gullet, which proceed from beside the Head and Neck, and are spread more largely upon the *Tunic* of the Gullet. *Blanchard*.

CEPHALOPHARYNGÆUM, is a Muscle that ariseth from that part where the Head is joined to the first *Vertebra* of the Neck; from thence marching down, it is spread about the *Pharynx* with a large *Plexus* of Fibres, and seemeth to make its Membrane. This straightens the Throat in swallowing.

CEPHALOPHONIA, is a Pain or Heaviness in the Head.

CEPHEUS, a Constellation in the Northern Hemisphere, consisting of 17 Stars.

CEPI Corpus, in the Common-Law, is a Return made by the Sheriff, that upon a *Capias Exigent*, or other Process, he hath taken the Body of the Party.

CERATIAS, according to some Writers, is a Horned Comet, sometimes appearing Bearded, and sometimes with a Tail or Train. Some Comets of this kind they will have to resemble the Figure of a New Moon; others that are Tailed, have a crooked Tail, bending either upward or downward; and others have their Tail of an equal Breadth or Thickness.

CERATODES, the same with *Cornea Tunica*.

CERATOGLOSSUM, is the proper Pair of Muscles belonging to the Tongue, proceeding from the Horns of the Bone called *Hyoidea*, and joined to the sides of the Tongue: Their use is to move or draw the Tongue straight into the Mouth, when they act jointly; but if either the one or the other be contracted singly, they move it to the Right or Left-side.

CERATUM or *Cerecloth*, is a Medicine applied outwardly, made of Wax, Oyls, and sometimes Dust intermixed, thicker than an Ointment, and softer than a Plaster.

CERCHNOS, is a certain *Asperity* of the *Larynx*, which to touch feels like a Collection of Juniper-berries, whence proceeds a little dry Cough. *Blanchard*.

CERCIS, is the second Bone of the Cubit, called *Radius*, because it's like the Spoke of a Wheel. *Blanchard*.

CEREA, are the Horns of the Womb in Brutes, wherein the *Fetus* is usually formed.

CEREBELLUM, is the hinder part of the Brain, consisting like the Brain it self, of an Ashy or Barkish Substance and a white Marrowy one, wherein the Animal Spirits which perform involuntary and meer Natural Actions, are supposed to be generated in Man; but not so in Beasts; it seems to consist of a great many thin Plates that lay upon one another.

CEREBRUM, the Brain, is strictly taken for the foremost part of the Substance, which is within the Skull; and it is a Substance of a sort peculiar to it self. Outwardly it is covered with the Skin called *Pia Mater*. It is wrought with many Turnings and Windings. Its exterior Substance is Ashy, wherein the Animal Spirits are thought to be generated: The Interior is white, which

receives the Animal Spirits from the former, and discharges them by the *Corpus Callosum*, and the *Medulla Oblongata* into the Nerves, upon which voluntary Actions do chiefly depend. Likewise the Brain is the Subject of Imagination, Judgment, Memory, and Reminiscence; for the Ideas or Species of things being received from the Organs of the External Senses, are carried to the common Senfory, or the Beginning of the *Medulla Oblongata*, and then by the *Corpora Striata*, and the *Corpus Callosum*, there the Judgment and Imagination are probably formed; but the Seat of the Memory is said to be in the Cortical Part of the Brain; and if the Idea's after some time chance to be called for out of the Place of the Memory, then it's properly said to be *Reminiscence* or Remembering. Sleep is likewise transacted in the Brain; concerning which see in its proper Place. *Blanchard*: See *Brain*.

CERTIFICATE (in Law) is used for a Writing made in any Court, to give Notice to another Court of any thing done therein.

CERTIFICATION of *Affre* of *Novel Dissaisin*, &c. is a Writ granted for the re-examining, or Review of a Matter passed by *Affize* before any Justices, and is called *Certification of new Discoveries*.

CERTIFICANDO de Recognitione Stapule, is a Writ directed to the Mayor of the Staple, &c. commanding him to certify the Chancellor of a Statute of the Staple, taken before between such and such, in Case where the Party himself detaineth it, and refuseth to bring it in.

CERTIORARI, is a Writ out of the *Chancery* to an Inferiour Court, to call up the Records of a Cause therein depending, that conscionable Justice may be therein administered, upon complaint made by Bill, that the Party which seeketh the said Writ, hath received hard *Dealing* in the said Court.

CERVICAL or *Vertebral Vessels*, are the Arteries and Veins that pass thro' the *Vertebrae* and Muscles of the Neck up to the Skull.

CERVICALIS Vena: *Vid. Vertebralis*.

CERUMINA, is the Filth or Wax of the Ear, which seems to be sweat out from the Cartilages: Others think it comes from the Glandules which border upon the Ears. It serves to hinder Dust, Motes or little Animals from getting into the Ear.

CERUSSE, or *White-Lead*, is Lead turned into a white Form by the Means of the Smoak or Vapours of boiling Vinegar.

CÆSARIAN Section or *Operation*, is the cutting open the Womb of the Mother to preserve the Child: And the

CÆSARIAN Birth, is that of a Child which is born this way; and those that were so, as *Cæsar*, *Scipio Africanus*, *Manlius*, &c. were called *Cæsares*, and *Cæsones*; a *Cæso matris utero*.

CESSAVIT, is a Writ that lieth upon this general Ground, that he against whom it is brought hath neglected to pay such Rents, or to perform such Service as he is tied to by his Tenure, and hath not upon his Land or Tenement sufficient Goods or Chattels to be distrained.

CETUS, the *Whale*, a Southern Constellation consisting of 23 Stars.

CHACONNE (in Musick) is a kind of *Sarabrand*, whose Measure is always Triple Time.

CHAFE, Seamen say a Rope chafes, when it galls or frets by rubbing against any rough and hard thing. Thus they say the *Cable* is chafed in the

the *Hawse*, when it is fretted or begun to be worn out there.

CHAIN, is an Instrument used in *Surveying*, to measure Land withall; of which there are several sorts, as,

1. A Chain of 100 Foot long, each Link being one Foot in length, and at each 10 Foot there is a Plate of Brass, with a Figure engraven thereon, to shew readily how many Feet are from the beginning of the Chain: And for more ease in accounting, there is, or should be, a Brass Ring at every five Links, that is, one between every two Plates.

This Chain is most commodious for measuring of large Distances or Lengths.

2. A Chain of 16 Foot and a half in Length, and made so as to contain 100 Links, with Rings at every 10th Length.

This Chain will be good to measure small Garden-Grounds or Orchards by Perch or Pole Measure.

3. A Chain of Four Pole or Perches in Length, which is 66 Foot or 22 Yards, for each Perch contains 16½ Foot. This whole Chain is divided into 100 equal Parts or Links, whereof 25 are a just Pole or Perch; and for ready accounting, there is usually a remarkable Distinction by some Plate or large Ring at the End of every 25 Links: Also at the End of every 10th Link, 'tis usual to fasten a Plate of Brass with Notches therein, noting how many Links are from the Beginning of the Chain.

This Chain of all others is the most commodious for Land-measure.

When you are to measure any Line by the Chain, you need to regard no other Denomination, but only Chains and Links set down with a Prick of your Pen betwixt them: Thus if you found the Side of a Close to be 6 Chains and 35 Links long, it must be put down thus, 6.35.

But if the Links be under 10, a Cypher must be prefixed; so 7 Chains and 9 Links must be thus set, 7.09.

How to cast up the Content of a Figure, the Lines being given in Chains and Links.

Having multiplied Length by Breadth or Base by the half Perpendicular, &c. according to the Rules for finding the Content of Figures under the Word *Area*.

Rule 1. From the Product cut off 5 Figures towards the Right-hand with a Dash of your Pen, fo shall those to the Left-hand again signify Acres.

2. If these five cut off to the Right-hand were not all Cyphers, multiply them by 4, and cutting off 5 Figures toward the Right-hand again, the rest will be Roods or Quarters.

3. Also, if amongst these five Figures cut off at the second Multiplication, there be any Figures besides Cyphers, then multiply all the five by 40, cutting off five again with a Dash, and those on the Left-hand signify Square Perches or Poles. As for Instance.

Having a Square Field given, whose Sides are each of them 7 Chains, 25 Links, the Content of this Square is required in Acres, Roods, and Perches.

Length 7.25
Breadth 7.25

3625

1450

5075

Acres 525625
4

Rood 102500
40

Perch 200000

Ans. 5 Acres, 1 Rood, and 1 Perch.

The Reason of this practical Rule is plain, if you consider that 5 Chains (or 20 Perches) in Length, and 2 Chains (or 8 Perches) in Breadth make an Acre (or 160 Square Perches); also 5 Chains multiplied by 2, is the same with 500 Links, by 200, which makes 100000 Square Links.

Wherefore 'tis evident, that 525625 Square Links, (i.e. the Product of 7.25 by 7.25) divided by 100000, that is, by cutting off 5 Figures on the Right-hand, leaves 5 Acres and 25625 Square Links over.

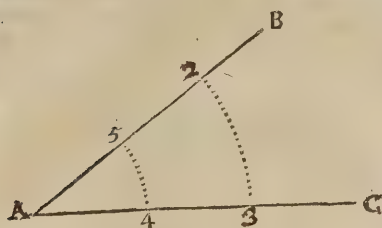
Also, if 25625 Square Links, do contain any Quarter or Quarters of an Acre; then 'tis but multiplying by 4, and dividing by 100000 (i.e. five cut off from the Products) they will contain so many Acres as now they do Quarters or Roods, for any number of Quarters multiplied by 4, produce the like number of Integers, and only Division reduces them to the right Denomination: So that 25625 multiplied by 4, gives 102500, which divided by 100000, leaves 1 Acre, and 2500 Quarters of Square Links over.

This last Remainder 2500 (being the true number of Square Links multiplied by 4) if multiplied by 40 (which is ¼ of 160) it must as often contain 100000 square Links, as the ¼ of 2500, i.e. 625, containeth the square Perches.

Thus, 100000 divided by 160 gives 625, as answering to 1 Perch: Also 2500 multiplied by 40, gives 100000, or 1 Acre (after Division) or five Figures cut off.

How by the Chain to take an Angle in the Field.

First, measure along the Hedge AB any small Distance, as A2, two Chains: Also measure along the Hedge AC what number of Chains you please, no matter whether they be equal to the former or not, as A3, two Chains: Then measure the Distance 2, 3, suppose it be 1 Chain 68 Links.



To plot which, draw the Line *AB* at pleasure, and set off 2 *Chains* from *A* to 2; then take in your Compasses the Distance *A3*, 2 *Chains*, setting one Foot in *A*; describe the Arch 2, 3; take also in your Compasses 1 *Chain*, 68 *Links*, set it from 2 to 3; and through the Point 3 draw *AC*, so you have the Angle *BAC* of the Field truly plotted.

The same may be otherwise performed thus;

Set a Stick in the Angle, and putting the Ring at one End of the Chain over it, take the other End in your Hand, and stretch out the Chain along the Hedge *AB*, and where it ends at 5, set a Stick; then stretch the Chain along the Hedge *AC*, and at the End thereof set another Stick, as at 4, then let loose the Chain from *A*, and measure the Distance 5, 4, which suppose 74 *Links*. Then plot it as before.

By this Means you may Survey a Field by going round the same with the Chain only, by taking all the Angles, and measuring the Sides. The same may be plotted by Direction given under the Word *Surveying*.

CHAIN-SHOT, is two Bullets, or rather half Bullets, with a Chain between them; their use is at Sea to shoot down Yards or Masts, or cut the Shrouds or any Rigging of a Ship.

CHAIN-WALLS, in a Ship, are the broad Timbers which are made jutting out of her Sides; to which with Chains the Shrouds are fastned, and by them spread out, the better to support the Masts.

CHAINS, in a Ship, are those Irons to which the Shrouds of the Masts are made fast to the Chain-Walls at the Ship's Sides,

CHALASTICK Medicines, are such as by their temperate and moderate Heat do comfort and strengthen the Parts to which they are applied.

CHALAZA, the Treadle of an Egg; every Egg has two of them, one in the obtuse, and the other in the acute End: There is more of them in the White, yea they stick closer to the Yolk, and are fastned to its Membrane. They are something long Bodies, more concrete than the White, and whiter, knotty, have some sort of Light, as Hail, whence they have their Name; for each *Chalaza* consists, as it were, of so many Hail-stones separated from each other by that White; one of them is bigger than the other, and further from the Yolk; is extended towards the obtuse End of the Egg; the other is less, and extends itself from the Yolk towards the acute End of the Egg. The Greater is made up of two or three Knots, like so many Hail-stones, which are moderately distant from each other, the less in order to succeed the greater.

It is also a Disease incident to Swine *Blanchard*.

CHALZIA, is a little Swelling in the Eye-lids like a little Hail-stone.

CHALCANTHUM Rubefactum, is only Vitrol calcined to Redness.

CHALLENGE (in Common-Law) signifies an Exception against Persons or Things; as a Prisoner may except against the partial impannelling of a Jury, or against the Insufficiency of the Jurors.

CHALOUPE: See *Shallop*.

CHALYBEAT, is that which partakes of the Nature of Steel; thus *Chalybeat Medicines* are a Preparation of Steel or Iron, or a Composition in which Steel or Iron is an Ingredient.

CHALYBEAT Crystals of Tar: See *Cream of Tartar*.

CHAMADE, is a Signal made by the Enemy, either by Beat of Drum or Sound of Trumpet, when they have any Matter to propound; as when they sound or beat a *Parley*.

CHAMBER, that Part of the Cavity of a great Gun where her Charge lies, is called the *Chamber*: Those Pieces which at Sea they call *Murtheers*, have *Chambers* which are put in at their Breeches.

CHAMBRANLE, an Ornament in Mafonry and Joyner's Work, bordering the three Sides of Doors, Windows and Chimneys. It is different according to the several Orders, and consists of three Parts, viz. the Top, called the *Traverse*, and the two Sides the *Ascendants*.

CHAMPARTY (in Common-Law) signifies a Maintenance of any Man in his Suit depending upon Condition to have Part of the things (be it Lands or Goods) when recovered.

CHANCE-MEDLEY (signifies in Law) the casual killing of a Man; not altogether without the Killer's Fault; though without an evil Intent.

CHANDELIERS, in Fortification, are Wooden Parapets made of two upright Stakes six Foot high, which support divers Planks laid across one another, or Bavins filled with Earth. They are made use of in Approaches, Galleries and Mines to cover the Workmen, and to hinder the Besieged from forcing them to quit their Labours. The only Difference between *Chandeliers* and *Blinds*, is, that the Former serve to cover the Pioneers before, and the Latter to cover them over Head.

CHANEL, in the *Ionick Capital*, is a Part which is somewhat hollow under the *Abacus* after the *Listel*, and lies upon the *Echinus*, having its Contours or Turnings on each Side to make the *Volutes*.

CHAOS: The ancient *Ethnick* Philosophers suppose the World to be formed at first out of a *Chaos*, that is a dark kind of turbulent Atmosphere, or a disorderly Sytem of Mixture of all sorts of Particles together, without any Regularity in any Respect. This the Greeks called *Ἥλον ἄερος*, *Zorodion*, and the Latins *Rudis Indigestaque Moles*—It is probable enough that the Notion came from *Moses*, who says, the Earth was without Form and void, and that *Darkness* was upon the Face of the *Abyss*: Though he gives no farther Description of it, nor tells us whence it took its Original, and came into such a confused State.

Mr. *Whiston* in his late new Theory of the Earth, supposes the ancient *Chaos*, the Origin of our Earth, to have been the Atmosphere of a Comet; for

which new, though indeed all things considered, not improbable Assertion, he endeavours to make out by many Arguments, drawn from the Agreement which appears to be between them: See his *Theory*, P. 69. So that according to him every Planet is a Comet formed into a regular and lasting Constitution, and placed at a proper distance from the Sun, revolving in a nearly Circular Orbit: And a Comet is a Planet either beginning to be destroyed or remade, that is, a Chaos or a Planet unformed, or in its Primeval State, and placed as yet in an Orbit very excentrical.

CHAPEAU, in Heraldry, is a Cap of Dignity used to be worn by Dukes; 'tis of a Scarlet Colour, lined with Ermines, and on it, as on a *Wreath*, the Crest of Noblemens Coats of Arms is born, and by it parted from the *Helmet*, which no Crest much touch immediately.

CHAPTERS (in Law) signifies a Summary or Content of such Matters as are to be enquired of, or presented before Justices in Eyre, Justices of Assize, or of Peace in their Sessions.

CHAPTERS, in Architecture, are the Crowns or upper Parts of a Pillar: Those that are destitute of Ornaments, are called *Chapiters with Mouldings*, such as the *Tuscan* and *Doric*; the first whereof is the most simple, having its *Abacus* Square without any Mouldings; but the *Abacus* of the other is crowned with an *Astragal* and three *Annulets* under the *Echinus*. All those that have Leaves and carved Ornaments, are termed *Chapiters with Sculptures*, and the finest of them is the *Corinthian*, which is adorned with two Rows of Leaves, as also eight greater, and as many lesser *Volutas* placed under a Body called a *Tympanum*. These are called usually *Capitals*.



CHAPPE, the Herald's Term for the Partition of an Escutcheon of this Figure; and they Blazon it thus, *Chappe Or*, and *Verr*.

CHARACTERISTICK of a Logarithm: See *Index* or *Exponent*.

CHARACTERS, are Marks, Signs, or Symbols of things invented by Artists, and peculiar to several Sciences, by which the Knowledge of the Things themselves is always more expeditiously and most times more clearly conveyed to the Learner; especially after he hath a little enured himself to them.

Characters used by Mathematicians, are chiefly in Geometry, Trigonometry and Algebra, and are as followeth:

= Is the Mark of Equality, though D. Cartes, I know not why, instead of it useth \propto , in which he is scarcely followed by any Body; and this (=) mark with him, or his Commentators, signifies the Difference of two Quantities when 'tis not known which is the greatest; which now a-days we mark thus ∞ . But now this Sign = is universally used for *Equal to*; and if you should see $a = 2b$, you must read it, a is equal to twice b .

+ Is in Algebra a Sign of real Existence in the Quantity it stands before, and therefore all Quantities that have no Signs are always suppo-

sed to have this Sign + before them. 'Tis called the *Affirmative* and *Positive Sign*, because it implies the Quantity to be of a Positive and Real Nature; and is directly contrary to the following Sign —.

This Sign + is also the Mark of Addition, and when you see $a + b$, you must read it a added to b ; or as the way usually is, a more b ; and you are to suppose it to be the Sum of those two Quantities a and b .

— Is the Note of Negation, Negative, Existence, or Non Entity in Algebra. And whenever it stands singly before any Quantity, it shews that Quantity to be no real one, but less than nothing; and therefore such Quantities are called *Negative*. Thus — 3 is a Negative 3, or 3 less than Nothing. And though such Quantities as these are only Imaginary, they have yet very great use in Algebra. And any one may have a distinct Idea of such a Negative Quantity, if he consider a Man to have in Cash, or be worth but 1000 Pounds, and yet to owe to 1500; for then that Man is certainly 500 l . worse than nothing; which Quantity of 500 l . in respect to him, will properly be expressed by putting this Negative Sign before it; for its truly to that Man — 500 l . or 500 l . less than, or worse than nothing.

This Character is also the Note of Substraction, and when you see $a - b$, you must read it, a , substrating or abating, or as the usual way is now, a less b ; implying, that the Quantity is the Difference between a and b , or the Remainder, when b the lesser is subtracted from a the greater. Therefore this Note (as also doth the foregoing) always belongs to the Quantity following it.

∞ Is the Character expressing the Difference between any two Quantities when is not yet discovered which is the greater: And therefore the Sign — cannot be used, because it always supposes the Quantity following to be less than what precedes it.

\times Is the Character of Multiplication, implying the Quantities on each Side the Sign, are to be multiplied one into another. Thus $a \times b$ is to be read a multiplied by b ; or the Rectangle between, or Product of a and b . But this Sign in Algebra is usually omitted, and the Quantities are put down like Letters in a Word. Thus ab signifies the Product of a multiplied by b . In compound Quantities the Sign is most times used, as $a + b \times c + d - e$.

\div Is the Mark of Division. Thus $a \div b$ signifies that the Quantity a is to be divided by b . But most times in Algebra the Quotient is expressed

Fraction-ways; as $\frac{a}{b}$ signifies the Quotient of a divided by b . Some Writers express it thus, $b) a$, (as in the common Division.

\odot Is the Character of Involution, as they call it, that is, of producing the Square of any Quantity, or of multiplying any Quantity into it self. In *Branker* and *Pell's Algebra*, and since that, in *Ward's* and others, 'tis placed in the Margin, and shews that the Step of the Equation against which it stands is to be multiplied by it self, or squared, or if it be a Square already, then to be raised up to that Power, which the Index set after the Character expresses, v. gr.

1 | ③ | 4 : a a a + 3 a a b + 3 b b a + b b b | shews

that the first Step of that Equation, which (was $n + b$) was, in the 4th Step, multiplied Cubically, or raised up to the 3d Power.

uu Is the Character of Evolution; that is, of Extraction of Roots out of the several Powers; and is the Reverse of the foregoing Sign ③.

: : Is the Mark of Geometrical Proportion disjunct, and is usually placed between two Pairs of Proportionals, as in the Golden Rule; thus 4 : 6 :: 8 : 12; and shews, that 4 hath the same Ratio to 6 that 8 hath to 12.

∴ Is the Mark of Geometrical Proportion continued, and implies the Ratio to be still carried on without any Interruption, as, 2, 4, 8, 16, 32, 64, 128 ∴. Some French Writers use this Mark for Arithmetical Proportion.

√ Is the Sign of Radicality, and shews (according to the Index of the Power that is set over or after it) that the Square Cube or other Root is extracted, or is to be so, out of any Quantity; as $\sqrt{25}$, or $\sqrt[3]{25}$, or $\sqrt{(2) 25}$,

signifies the Square Root of 25; and $\sqrt[3]{25}$, or $\sqrt{(3) 25}$, signifies the Cube Root of Twenty five. Sometimes this Radical Sign belongs to as many of the following Quantities as have a

Line drawn over them; as, $\sqrt{b + d}$ signifies the Square Root of the Sum of b and d added

together: And $\sqrt{(3) f + c - g - 3}$ signifies the Cube Root of the Sum of f and c , after g is subtracted from that Sum; and that after this, 3 is to be taken from the said Cube Root.

⌋ or ⌋ Is the Character of Greater, and

⌋ or ⌋ The Sign of the Lesser of any two Quantities.

|| Is the Mark for Parallel, and implies, that 2 Lines or Planes are equidistant one from another.

△ Triangle.

□ Square.

◻ Rectangle.

○ Circle, or Sol the Sun.

∨ Equi-angular or Similar.

≡ Equilateral.

∠ Angle.

⊥ Right-Angle.

⊥ Perpendicular.

:: Is the Mark for Arithmetical Proportion.

ȳ, ẋ, ȳ. Any Letters with Points so over their Heads, denote the Fluxions of variable Quantities: And if they have 2, 3 or 4 Points, they denote Second, Third or Fourth Fluxions: See Fluxions.

— 1, — 2, — 3, — 4, &c. are the Exponents of a Series of Fractions in a Geometrical Progression.

$\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, are the Exponents of \sqrt{x} , $\sqrt[3]{x}$, $\sqrt[4]{x}$, which therefore in the new Notations are written thus, $x^{\frac{1}{2}}$, $x^{\frac{1}{3}}$, $x^{\frac{1}{4}}$, &c. Also

$x^{\frac{1}{2}}$, stands for \sqrt{x} ; and in Fractions,

x^{-1} , x^{-2} , x^{-3} , stand for $\frac{1}{x}$, $\frac{1}{x^2}$, $\frac{1}{x^3}$, &c. Al-

so $x^{\frac{1}{2}} + \frac{1}{2}$ expresses the Product of $x^{\frac{1}{2}}$ into $x^{\frac{1}{2}}$, and $x^{-\frac{1}{2}} - \frac{1}{2}$ (or $x^{-\frac{3}{2}}$) is the Product of $x^{-\frac{1}{2}}$ into its self, or Square of $x^{-\frac{1}{2}}$.

$x^{\frac{1}{2}} - \frac{1}{2}$ (or $x^{\frac{1}{2}}$ is the Exponent of the Quotient of $x^{\frac{1}{2}}$ by $x^{\frac{1}{2}}$.

$\frac{a+b}{a+b}^{-1}$ Expresses an Unite divided by $a+b$.

$\frac{a+b}{a+b}^{-3}$ Is an Unite divided by the Cube of $a+b$.

$\frac{a+b}{a+b}^{\frac{1}{2}}$ Is the Biquadratic Root of the Cube of $a+b$.

CHARACTERS CHYMICAL

<p> Air Δ Aërium ☉ Alum ○, □ Amalgam $\Delta\Delta$. #, ✕ Alembick X Antimony ◇, ◇, ⬢ Asenick ∞, ∞ Auripigmentum □ □ Auri chalcum ♀ ♀ aqua communis ▽ wavy Vita ♄ Fortis W or Spenting water Regis R, V or Stygian water Distillata ▽ shes E th or Balneum B neium arrosion on sand Bath AB neium Maria or Mari's MB neium vapors V e Armenick AB rax W ↗ ↘ ick ⊠ ick Sulphur ⋈ Calcine ∪ mphire ○○○○ inabar H ⬢ 3 lx Viva ♀ lx in General C out Mortuum ⊙ </p>	<p> Ceruss ‡ to Clement Z to Coagulate H, E Copper or Venus ♀ Cop. Burnt or Es Ussu. 7, 8, 9 Chrystal ♄ Comon Salt ⊖, ⊖, ⬢, ▤ Crocus Martis ⚔ ⬢ Crocus of Cop. See Es Ussum Crucible + ♁ a Cucurbite ♂ Δ to Digest S to Distill ♂ ∞ Distilled Vinegar + Day. or Light ♂ Earth ♃ Fire Δ wheel Fire ⊙ to Fix ♄ to Filtrate Z Flowers of Antimony ⚔ Filings of Steel ○→ Gold ○ * Classe ○ Gravelled Ashes F Gum g t g Martis Horn C C an Hour 8, 8 </p>	<p> Ink ☐ Iron ♂ Iupiter or Tinn 4 Isad or Satum H, J, X Lime C, C Quick Lime or Calcevia ♀ Litharge → to Lute N Lutum Sapientia L a Marcasite M, O, P, Q, R Mercury ♄ Mercury Sublimate ♄, ♄ —Precipitated ♄, ♄ a Month ☒ Magnet ∞ Mars Iron or Steel ♂ Night ♀ Nitre or Salt Peter ⊖ Oil ○, ○, &, ⬢, X Philosophers Sulphur A to Precipitate = to Purify ∞ Powder P, ⬢ Pot Covered ♄ Quintessence L C Realgar X, O, S Retort C, C Sand △ Saffron of Mars see Crocus martis </p>	<p> -of Venus see Es Ussum Soap ◊ Sal Alkali 8 ☐ Sal Armoniac * Salt Comon ⊖ ⊖ 8 ▤ Sal Gemma 8 ◊ Sulphur ⚔ ⚔ Sulphur Philosphorum A black Sulphur ⋈ Sulphur Vivum ⚔ to Sublime = ∞ Spirit ∞ Sp. of Wine V Stratum Super Stratum S.S.S. Sol or Gold ⊙ Silver (,) Talck X Tartar ☐ Tutia or Tutty X Tincture R Vitriol ⊖ ⊖+ white Vitriol □ □ blew Vitriol ⊖+ Verdigrease ⊕ Vinegar + X distilled Vinegar 8, * Urine □ Wax ⬢ </p>
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CHARGE, in Heraldry, signifies whatever thing is born, in the Field of a Coat of Arms; whether Animal, Vegetable, or any other Representation or Figure. Proper Charges are called *Ordinaries*: Which see. Thus *Guillem*, but *Bloom* calls those *Charges* on which Rewards and Additions of Honour are often placed in a Coat of Arms, such as *Cantons*, *Quarters*, *Gyrons*, *Flaks*, &c.

CHARGE, the Seamen call a Ship, a *Ship of Charge*, when she draws much Water, or swims deep in the Sea; and sometimes it's us'd for an unweildy Ship that will not ware nor steer, for such a one they say also is a *Ship of Charge*.

CHARLES's WAIN, seven Stars in the Constellation called *Ursa Major*.

CHART, is a Draught projected for the use of Seamen, Discovering the Sea-coasts, Sands, Rocks; and is sometime taken for the *Nautrical Compass*.

CHARTA *Pardonationis se defendendo*, is the Form of a Pardon slaying another Man in his own Defence.

CHARTA *Pardonationis utlagarie*, is the Form of a Pardon for a Man that is outlawed.

CHARTER-PARTY, is an Indenture of Covenants and Agreements made between Merchants or between Owners of Ships and the Masters and Sea-faring Men, touching their Affairs, or Commanders.

CHARTIS Reddendis, is a Writ which lies against him that hath Charters of Feoffment, de-

livered him to keep, and refuseth to deliver them.

CHASE, to *Chafe* is to pursue a Ship at Sea, which is called *Giving Chase*. A *Stern Chase* is when the Chaser follows the Chased a-stern, directly upon the same Point of the Compass: To lie with a Ship's Fore-foot in a *Chafe*, is to sail and meet with her by the nearest distance, and so to cross her in her way, or to come across her Fore-foot. A Ship is said to have a *good Chase*, when she is so built forward on, or a-stern, that she can carry many Guns to shoot forwards or backwards, and so hath either a *good Forward*, or a *good Stern-Chase*.

CHASE-GUNS, are such whole Ports are either in the Head (and then they are used in *chasing of others*) or in the Stern, which are only useful when they are purfued or chased by any Ship or Ship.

CHASE *of a Gun*, is its whole Length.

CHAUSE-TRAPPES, or Coltraps, in *Fortification*, are Iron Instruments with four Spikes about 4 Inches long, made after such a manner, that whatsoever way they fall, one Point will always lie uppermost like a Nail. They are usually scatter'd and thrown into Moats and Breaches to gall the Horses Feet, and to stop the hasty approach of the Enemy.

CHECKY, the Herald's Term for a Bordure or Ordinary that hath more than two Rows of Checkers; for if it hath only one, they call it *Counter-composed*.

CHEEKS, are (in a Ship) two Pieces of Timber fitted on each Side of the Mast at the Top, serving to strengthen the Mast there; and also having Holes in them (which are called *Hounds*) through which the *Ties* run to hoist the Yards.

Also the uppermost Rail or Piece of Timber in the Beak of a Ship; and those on each Side the *Trail Board*, are called the *upper and lower cheek*. The *Knees* also which fasten the Beak-Head to the Bows of a Ship are called *cheeks*; and so are the Sides of any Block, as also the Sides of a Ship-Carriage for a Piece of Ordnance.



CHIEF, one of the Eight Honourable Ordinaries in Heraldry, containing a Third Part of the Field, and determined by one Line, either straight or crooked, that is, *Invested, Engrailed, &c.* drawn through the Chief Point of the Escutcheon. Thus the Field is *Gules, a Chief, Argent*. He beareth *Gules, a Chief Girelle, or Embattelée, Argent*.

Sometimes one Chief is born upon another, which is called *Surmounting*, and it is usually expressed by a Line drawn along the upper part of the Chief; for if the Line be drawn along the lower Part of the Chief, it is called a *Fillet*. The former of these is an Addition, the latter a Diminution of Honour. *Chief Point*: See *Escutcheon*.

CHEMIN de Ronds, in Fortification, is the way of the Rounds, or a Space between the Rampart and the low Parapet under it for the Rounds to go about. The same with the *Fausse Bray*.

CHEMISE, in Fortification, is a Wall with which a Bastion, or any other Bulwark of Earth is lined for its greater Support and Strength; or it is the Solidity of the Wall from the *Talus* to the Stone Row.

CHEMOSIS, is the Tumour of the *Albugineous Tunick* that maketh the Black of the Eye appear Concave, being a very great Inflammation of the Eyes with vehement Pain, both the Eye-lids being turned the Inside out, so that the Eyes can scarcely be covered with them, whilst the White of the Eye stands higher, and the Red runs over most Part of the *Iris*.

CHERSONESUS, a Term in Geography, being the same with *Peninsula*, and signifies a Part of the Land enclosed all round about with Water, except one narrow Neck, by which it joins to the Main Land; and that Neck is called an *Isthmus*.

CHESSE-TREES, are two small Pieces of Timber with a Hole in them, on each Side of the Ship, a little before her *Loof*, for the Main Tack to run through, and to which it is haled down.

CHEVAUX de Frise, or *Friseland Horse*, in Fortification, is a large Joist or Piece of Timber about a Foot in Diameter, and ten or twelve in Length; into the six Sides thereof are driven a great number of Wooden Pins about six Foot long, crossing one another, and having their Ends armed with Iron Points. Their chief Use is to stop up Breaches, or to secure the Avenues of a Camp from the Inroads both of Horse and Foot. They are much the same with *Turn-pikes*.

CHEVILS, or *Keils*, are small Pieces of Timber nailed to the Inside of a Ship to *belay* or fasten the *Sheets* and *Tacks*.

CHEVRON, one of the Honourable Ordinaries in Heraldry: It represents two Rafters of an House set up as they ought to stand, and was anciently the Form of the Priestesses Head Attire. It contains the Fifth Part of the Field, and is Figured thus:



He beareth *Gules, a Chevron Argent*, by the Name of *Fulford*. The *Chevron* is divided into the

CHEVERONEL, which is the Moieties of a *Chevron*; and a *Couple-Close*, which is the fourth Part.

CHICANRY, is a trickish and guileful Practice of the Law.

CHILIADS; so the *Tables of Logarithms* are frequently named by many Authors.

CHILOGON, a Regular Plane Figure of 1000 Sides and Angles; of which, though the Eye can form no distinct View, we may have a very clear Idea in the Mind; and can easily demonstrate, that the Sum of all its Angles are equal to 1996 Right ones; for the internal Angles of every Plane Figure, are equal to twice as many Right Angles as the Figure hath Sides; except those 4 which are about the Point in the Middle, from whence the Figure is resolved into Triangles.

CHIMES of any Clock: How to calculate Numbers for them, and to fit and divide the *Chime-Barrel*: See in *Watch-Work*.

CHIRAGRA, is a sort of Gout in the Hands only.

CHIROGRAPHER, is he that in the Common-Pleas, ingrosses Fines acknowledged in that Court into a perpetual Record (after they are acknowledged and fully passed by those Offices by whom they are first examin'd) and that Writes and delivers the Indentures, one for the Buyer, and another for him that sells, and makes another indented Piece, containing also the Effect of the Fine, which he delivers over to the *Custos Brevium*, which is called the *Foot of the Fine*. The *Chirographer* also, or his Deputy, proclaims all the Fines in the Court every Term, according to the Statutes, and then repairing to the Office of the *Custos Brevium*, there endorses the Proclamations upon the Back-side of the Foot thereof, and always keeps the Writ of Covenant, as also the Note of the Fine.

CHIROMANCY, the same with *Palmastry*, is a pretended way of Divination, telling of Forturities, presaging Futurities, or discovering the Tempers and Constitutions of Persons by a ridiculous Inspection into the Hand, and Observation of Wrinkles and Strokes of the Skin.

CHIVES, is the Botanic Word by which our Mr. Ray renders the Latin *Apices*: Which see. But Dr. Grew calls the *Stamina* on which the *Apices* are fixed, by this Name of *Chives*.

CHLOROSIS, or *Morbus Virginis* commonly *Icterus Albus*, or the *Green-sickness*, seems to be a kind of Phlegmatick Pituitous Dropsy, arising from an Obstruction of the Menfes, want of Fermentation in the Blood, and Detention or Depravation of the Ferment in the Womb; whereupon the Muscu-

Muscular Fibres being obstructed, they become Lazy and unfit for Action. *Blanchard.*

CHOANA, is a sort of Cavity or Tunnel in the *Basis* of the Brain, by which the serous Excrements are brought down from the Ventricles of the Brain to the *Pituitary Glandules*; also the *Pelvis* of the *Reins*, of which in its proper Place. *Blanchard.*

CHOLEDOCHUS *Ductus*, is the Communion of the *Ductus* or *Porus Biliaris* with the *Ductus Cysticus*, into one Passage, and is thence called the *Ductus Communis Choleodochus*. This goes obliquely to the lower End of the *Duodenum*, or the beginning of the *Jejunum*; and creeping obliquely between the Tunicks of the Intestine, hath the Return of the *Bile* hindered (as by a Valve) from coming into the *Ductus* again.

CHOLER: See *Bile*.

CHOLERA *Morbus*, is a depraved Motion of the Ventricle and the Guts, whereby the *Bilious Excrements* are discharged in great plenty upwards and downwards. *Blanchard.*

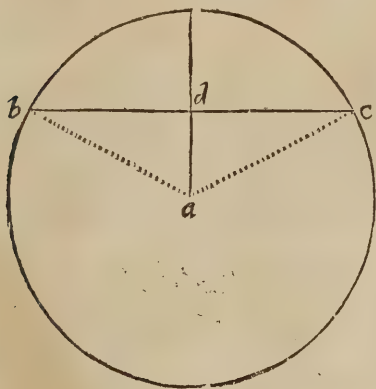
CHOLOGOGUES, are Medicines which purge *Choler*, Sulphureous and Bilous Humours; as *Rhubarb*, *Senna*, &c. according to the old Notion.

CHONDROSYNDESMUS, the joyning or uniting of the Bones by a Cartilage placed betwixt them.

CHORD, in Geometry, is a Right Line connecting the Extremities of any Arch of a Circle, and is otherwise called a *Subtense*.

Prop. I.

A Chord (*bc*) is bisected by a Perpendicular (*ad*) drawn from (*a*) the Center.

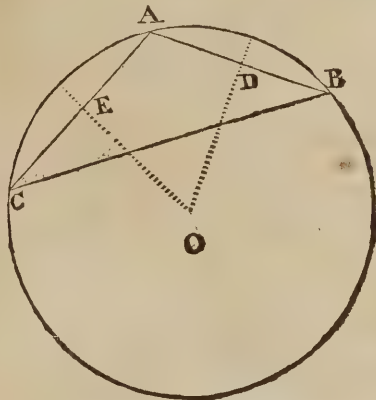


For the Triangle *abe* is an *Isoceles*, (because $ea = ba$) and therefore the Perpendicular *ad* bisects the *Base* or Chord *bc* (10. e. 1. *Encl.*) and consequently the Ark *bc* is also by this Means bisected. From whence are deducible and demonstrable these

Problemes.

1. To make a Circle pass thro' any three Points given, nor lying in a Right Line.
2. To find the Center of any Circle.
3. To compleat a Circle from an Ark given.
4. To describe a Circle about any Triangle given.

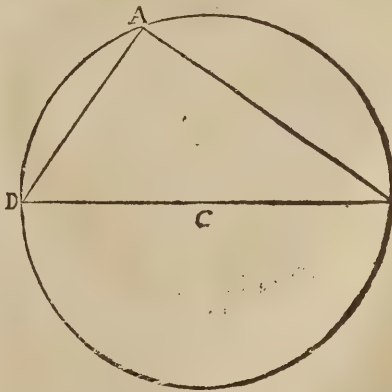
1. Let the three Points be *ABC*; join *AB* and *AC*, which bisect in *D* and *E*, by drawing the Perpendiculars *DO* and *EO*: The Point *O*, where they cross one another, must be the Center, because they both pass thro' it by this Proposition. With the Distance *AO* draw the Circle, and the Demonstration will be plain.



2. If the Circle had been given, or any Part of it, as suppose the Ark *CAD*, and the Center of the Circle had been required: You need only mark out any three Points in the Circumference; as suppose *A, B, C*; then proceed as before, you'll find the Center *C*.

3. The same way also you may describe a Circle about the Triangle *ABC*; for the Perpendiculars that bisect any two Sides of the Triangle, will, where they cross, find the Center *C*, from whence a Circle being drawn, it shall circumscribe the Triangle *ABC*. The Demonstration is the same with the former.

N. B. The Center of a Circle may very easily be found by the Square thus; Apply the Corner of the Square any where to the Circumference, as suppose at *A*; and draw *DR* between the Points where the Legs cut the



Circumference. The Line bisected, shall give *C* the Center of the Circle; for the Angle *DAR* being a Right one, *DR* must be the Diameter, by 31. e. 3. *Encl.* The half of which *DC* or *CR* must be the Radius.

CHORDA Membrana Tempani, is a certain Nerve coming from the third Branch of the fifth Pair, extended above the Membrane of the Tympanion or Drum of the Ear, and which goes also to the Muscles of the Malleolus, and then joins the *Portio Dura* before it comes out of the Cranium.

CHORDAPSUS, so *Celsus* names it, barbarously called *Miserere me*; by others *Iliaca Passio*, by others *Volubulus*, commonly *Ileus*; is an Ejection of the Excrements at the Mouth only, because the Peristaltick or Vermicular Motion of the Guts, whereby the Excrements are excluded, becomes inverted. *Blanchard*.

CHOREA Sancti Viti, is a sort of Madnefs, which formerly was very common amongst some People, wherein the Person affected laid not down, but ran hither and thither dancing to the last Gasp if they were not forcibly hindered. *Horslius* says, That he hath spoke with some Women, who paying a Yearly Visit to the Chapel of Saint *Vitus*, which is near the City *Ulme* in *Sweedland*, have been taken with such a Violent fit of Dancing Night and Day, together with a sort of Frantickness in the Mind, that they fall together like so many People in Extasies; and are sensible of little or nothing for a Year together till next *May*, about which time they perceive themselves so tormented with a Restlessness in their Limbs, that they are forced to repair to the same place again about the Feast of Saint *Vitus* to Dance.

CHOREUS, vulgarly called *Trocheus*, is the Foot of a Latin Verse, consisting of two Syllables, where the first is long, and the last short, as *Anrus*; so that this is the Reverse of an *Iambus*.

CHORIAMBUS, is the Foot of a Latin Verse compounded of a *Chorus* and an *Iambus*; it consists of four Syllables, of which the first and last are long, and the middle ones short; as *Historie*.

CHORION, is the outer Membrane involving the *Fœtus* in the Womb; 'tis pretty thick, smooth within, but rough without-side to which the *Placenta* adheres: It hath many Vessels which spring from the *Placenta*, and from the Umbilical Vessels. The former are dispersed thro' it before the *Fœtus* is shaped (as *Diemerbroek* affirms) but the latter not till the Navel-Rope is grown out to a just length; at which time they enter in it, and are intermixt with the former, and from this Membrane are inferted into the *Placenta* to which the *Chorion* adheres. This Membrane, the *Chorion*, is always single, tho' the *Fœtus* be *Twins*, tho' then there is a double *Amnion*, treble, quadruple, &c. if the *Fœtus* are 3, 4, &c. Originally the *Chorion* did invest the *Ovum*, but when that is brought down into the Womb, and is become a Conception, this Membrane imbibes the Moisture of that part very plentifully; for while the Conception lies loose there, and is fastned to no part by any Vessels which go from it, or come to it, it seems to have its increase just as the Egg hath in the Body of the Hen; which whilst it is in the *Racemus* or Knot, hath no other Substance but the Yelk; and when it drops off from thence, and descends thro' the *Infundibulum*, it receives no Alteration, but when it comes into the Cells of the Process of the *Uterus*, it begins (saith *Harvey*) to gather a *White*, altho' it yet stick to no part of the *Uterus*, nor hath any Umbilical Vessels: But just as the Eggs of Frogs and Fishes gather themselves a *White* out of the Water, so doth there come out of the *Plicæ* or Wrinkles of the Womb

an Albugineous Moisture, whence the Yelk (by its vegetative and innate Heat) gathers and concocts its *White*. After this manner doth the *Chorion* imbibe that Albugineous Matter, which from the first Conception encreases daily in it (and which transudes thro' the *Amnion* in which the *Embryo* swims) till the Umbilical Vessels and the *Placenta* are formed; from and thro' which the *Fœtus* may then receive its Nourishment. And the Liquor which this *Chorion* imbibes, *Dr. Gibson* takes to be the Nutritious Juice which oozes into the Cavity of the *Uterus* out of the Capillary Orifices of the Hypogastrick and Spermatick Arteries, and is of the same Nature with that which is afterwards separated in the *Placenta*, and carried to the *Fœtus* by the Umbilical Vein, and with that also which abounds in the *Amnion*, even till the Birth: For the Plastic or Vegetative Virtue is only in the *Ovum* it self, and the Augment that the first Lineaments of the *Fœtus* receives, is only by Apposition of this Nutritious Juice. But the *Chorion* is grown so dense and thick by that time the *Placenta* and Umbilical Vessels are formed, that it is not capable of imbibing more; but that which in this time is in it, doth in a little while transude into the *Amnion*, and so it self becomes empty, and gives way to the encrease of the *Allantoïdes* (which from hence begins to appear) and whose Liquor encreases daily as the *Fœtus* grows near to the Birth. This Opinion, which seems indeed very probable, the Learned *Dr. Gibson* in his *Anatomy* (last Edition, p. 220.) proposes only as a Conjecture, and submits it to the Censure of the Learned.

CHOROGRAPHY, is a particular Description of some Country, as of *England*, *France*, or any Shire or Province in them, &c.

CHOROIDES, is the folding of the *Carotidal Artery* in the Brain, wherein is the *Glandula Pinalis*: It is also the *Uvea Tunica*, which makes the Apple of the Eye.

CHROMATICK, a Term in Musick, being the second of the three kinds, which abounds in Semi-tones, and contains only the least *Diatonical Degrees*. It is recorded in History, that *Timotheus* the *Milesian* first invented this sort of Musick, in the time of *Alexander the Great*, and the *Spartans* banished him because being accustomed only to the *Diatonick* kind, they judged the *Chromatick* to be too soft.

CHRONOLOGY, in the common Sense of the Word now, is the Arithmetical computing of Time for Historical Uses; so as thereby truly to date the Beginnings and Ends of Princes Reigns, the Revolutions of Empires and Kingdoms, Battles, Sieges, or any other Memorable Actions.

CHRONOMETRUM *Perpendicularum*, or *Chromoscopium*, the same as *Pendulum*: Which see.

CHRONOSCOPE, the same with a *Pendulum* to measure Time: See *Pendulum*.

CHRYSOCERAUNUS Pulvis, is the same with *Aurum Fulminans*: Which see.

CHRYSTAL Mineral: See *Sal Prunella*.

CHRYSTALS of Copper: See *Vitriol of Copper* or *Venus*.

CHRYSTALS of Silver, or *Vitriol of the Moon*, is an Operation in Chymistry, where by the Body of Silver is opened and reduced into the form of a Salt by Spirit of Nitre. 'Tis done thus; Dissolve an Ounce or two of Silver in about three times the Weight of *Aqua Fortis*, or which is better, good Spirit of Nitre. Evaporate the Dissolution in a Glass

Glass Cucurbit and over a Sand-heat till about $\frac{2}{3}$ of the Liquor is blown off, then let the Remainder stand without stirring it, and it will shoot into Crystals, which take out, and when they are dry, keep them in a Viol well stopp'd. These Crystals are used to make an Eschar, by touching any part with them. They are also given inwardly in Dropsies sometimes, from two to six Grains, and they will purge gently. The Purgative Quality in these Crystals (there being no such thing either in the Silver or the Spirit of Nitre) must arise from the new Texture and Conformation of the Parts of both, happening from this Union of the Parts of the Silver with those of Spirit of Nitre.

These Crystals may easily be revived into good Silver again, if you put them to dissolve, as they will readily do in a Vessel of hot Water, in the bottom of which you shall have laid a Plate of Copper; the Silver will precipitate down in a white Powder, which gather, wash and dry, and then melt it in a Crucible with a little Salt Petre, 'twill run into good Silver of the same weight as at first.

CRYSTALS of Tartar : See *Cream of Tartar*.

CRYSTALLINE Heavens, in the Ptolemaick System were two. One served them to explain the slow Motion of the fixed Stars, and caused them (as they thought) to move one Degree Eastward in about 70 Years.

The Second helped them out in solving a Motion, which they called the Motion of *Trepidation* or *Libration*; by which they imagined the Sphere to swag from Pole to Pole.

CRYSTALLINE Humour of the Eye : See *Humours*.

CRYSTALLIZATION, is an Operation in Chymistry, by which the Salts dissolved in any Liquor are made to shoot into little prettily figured Lumps or Fragments, which they call *Crystals*, from their being pellucid or clear like Crystal. In order to bring the Salts duly to *Crystallize*, you must gently evaporate part of the Moisture; for if there be too much Liquor in proportion to the Salt, it will not coagulate or crystallize at all; and if there be too little, the Salts will all run into one another, and not crystallize regularly. The general Rule to know when enough of the Moisture is evaporated, is when a little Skin begins to be on the Surface of the Liquor.

CHYLE, is a white Juice in the Ventricle and Intestines, proceeding from a light Dissolution and Fermentation of the Victuals, especially of their Sulphur and Salt with which Edible things abound, and which by the Invention of the *Acid Humour* in the Ventricle becomes white; for if you pour an Acid upon any Liquor that is impregnated with Sulphur and Volatile Salt, it presently turns Milky, as is obvious in preparing Milk of Sulphur, or the Resinous Extracts of Vegetables. Nay, Spirit of Harts-horn and of Soot, abounding with Volatile Salt, if it be mix'd with an Acid, or with but plain Water, grows to be of a Milky Colour: At last the Chyle after a Commixtion and Fermentation with the Gall, and the Pancreatick Juice, either Volatile or Acid, passing the *Lacteal Veins*, &c. is mixed with the Blood. It is called in Latin also *Chymus*, *Blanchard*. As to the manner how this chyle is first made and perfected, see

CHYLIFICATION, which is the Action of the Stomach, Guts, &c. in the making of Chyle, and 'tis done thus, as I find the Accurate Mr. William Couper, Chyrurgeon, hath accounted for it in a Paper published in *Philos. Transactions*, N, 220.

The Aliment which is usually taken down into the Stomach of Adult Persons, is such whose Grossness of Parts requires *Mastication* or *Chewing*: In order to which, the *Dentes Incisores* are sometimes employed to divide it from the more Bulky Part, and to receive it into the Mouth; and then the lower Jaw being variously moved by its proper Muscles *Mastication* is begun, and carried on by the Assistance of the Tongue, Cheeks, and Lips, the two first still applying the less divided Parts of the Aliment to the *Dentes Molares* till there is an equal Communion of all its Parts; nor is the Action of *Mastication* merely performed for dividing the grosser Parts of the Aliments, but divers of the Muscles employed in the Motion of the lower Jaw, are at the same time also serviceable in hastening the *Saliva* or *Spittle*, separated from the Blood by the Parotid Glands, those of the lower Jaw, and under the Tongue, into the Mouth; the Saliva Glands of the Cheeks and Lips also contributing their Juice; do altogether joyn with the Masticated Aliments, before, or at the same time it's made fit to be swallowed; which Action is called *Deglutition*.

Deglutition is thus performed: The Aliment, as well what's fluid as that masticated, being lodged on the Tongue, which does somewhat hollow it self by means of its own proper Muscular Fibres, for the more commodious entertaining the larger Quantity, its Tip and Sides are applied to the Indices of all the Teeth of the upper Jaw, (and *Gingivæ* or Gums of those that want Teeth) the Tongue is suddenly drawn up by the *Musculi Styloglossi* or *Myloglossi*, together with those Muscles which pull the *Os Hyoides* upwards; at the same time the Fauces are drawn up, and their Cavity enlarged by the *Musculi Stylopharyngei*; and about two thirds of the Tongue's superiour Surface is adequately applied to the Roof of the Mouth; the *Epiglottis* from its Position being consequently depressed, does thereby cover the *Glottis* or *Rimula* of the *Larynx*, and prevents any part of the Aliment from descending into the Wind-pipe: In this part of the Action of *Deglutition* the Glands under the Tongue, and excretory Ducts of those of the lower Jaw are compress'd, and their separated Liquors or Spittle voided by their *Papillæ*, situated at the lower part of the *Frenum* or Ligament of the Tongue; and this is done by the *Musculus Mylo-Hyoidæus*; when the Aliment by the abovementioned Motion of the Tongue, is forced into the Fauces or upper part of the Gula; at the same time the *Gargareon*, together with the *Uvula* are drawn upwards by the *Musculi Sphænostaphili*, by which means any part of the Aliment is hindered from ascending into the *Foramina Narium*: The Fauces by the *Musculus Pterygopharyngeus* and *Oesophagus* are contracted, whereby the Aliment is not only compress'd into the Gula, but the Matter separated from the Blood by the Glands of the Fauces, especially of those large ones called *Tonsillæ*, is forced out of their Cells or Excretory Ducts, to join with it in its descent to the Stomach by Gula, through which the latter passes by the Action of its Muscular Fibres.

The Aliment thus impregnated with *Saliva* in *Mastication* and *Deglutition* being received into the Stomach, there meets with a Juice separated from the Blood by the Glands of that Part whose Excretory Ducts open into the Cavity of the Stomach: By the commixture of these Liquors, whether of *Saliva* or the Juice of the Stomach a pro-

per *Menstruum* is compos'd, by which the Parts of the Aliment are still more and more divided by its insinuating into their Pores, and by which the Air before imprison'd in their less-divided Parts, is not only set more at liberty, but by the natural Heat, it must necessarily suffer such a Rarefaction, as that thereby the whole Stomach becomes still more and more distended; hence it is we have less Appetite sometime after eating (when this Intumescency is made) than we had immediately after; hence also arise those frequent *Eruptions* from divers Aliments, as old Pease, Cabbage, and divers other Vegetables we frequently eat; all which become very much disturbing in deprav'd Appetites and weak Stomachs. Though we have not us'd the Word *Fermentation*, yet we do not suppose the Dissolution of the Aliment within the Stomach can be done at least without an Intestine Motion of its Particles with the *Menstruum*; but we have omitted that Term, because it may be apt to lead us into an Idea of a greater Conflict than in truth there really is.

At the same time this Intumescence an Agitation of the Matter is made in the Stomach, the Contents of the neighbouring excretory *Ductus*'s namely, the Bile in the Gall-Bladder and Liver-Ducts, and Pancreatick Juice in the *Ductus Pancreaticus*, are compress'd into the *Intestinum Duodenum*, through the Extension of the Stomach it self; the reflux Blood of the Stomach at that instant being in some measure retarded, whereby the *Muscular Fibres* are more liable to be contracted.

Nor can we conceive how the Liquor of the Stomach, after having joyn'd with the *Saliva* and Aliment, should be still so plentifully excreted from the Glands of that Part, as to irritate its Internal Membrane, and excite its *Muscular Fibres* to contract, since the Muscles of the *Abdomen* would, like as in Vomiting, be drawn into a Consent of Co-operating, and the Aliment would be forcibly rejected by the Mouth: Besides, should the Liquor of the Stomach be so disturbed in *Chylification*, what would it be so soon as all its Contents were discharged? The Irritation the Stomach undergoes in Hunger, we are firmly perswaded does not arise but through an Accumulation of the *Saliva* in the Stomach, in conjunction with the Liquor of the Glands of that Part; whence it is we rather discharge the Spittle at that time by the Mouth, than to suffer any more of it to descend into the Ventricle: Hence proceeds what we call the *watering of the Mouth*; hence also, when the *Saliva* is vitiated, the Appetite is deprav'd.

The Stomach, by means of its *Muscular Fibres* contracting it self, does gradually discharge its Contents by the *Pylorus* into the *Duodenum*, in which Gut, after a small *Semicircular* Descent, it meets with the Pancreatick Juice and Bile; both which joyning with it, renders some Part of the Aliment more fluid, by still disuniting the grosser Parts from the more pure; and here *Chylification* is made perfect.

The Bile which abounds with *Lixivial* Salts, and apt to intangle with the grosser Parts of the Concocted Aliment, stimulates the Guts, and deterges or cleanses their Cavities of the *Mucous Matter*, separated from the Blood by the Glands of the Guts, and lodged in their Cavities; which not only moistens the Insides of the Guts, but de-

fends the Mouths of the *Lacteal* Vessels from being injured by *Alien Bodies* which often pass that way.

The Contents of the Intestines moving still on by means of the *Peristaltick* or Worm-like Motion of the Guts, whilst those thinner Parts fitted for the Pores of the *Lacteal* Vessel called *Chyle*, is absorbed by them, the thicker move still more slowly on, and by the many Stops they continually meet with by the *Connivent Valves*, all the *Chyle* or thin Parts are at length intirely absorbed, the Remains being merely *Excrementitious*, are only fit to be excluded by Stool.

The Analogous White Appearance of the *Chyle*, whether in the Stomach or Intestines, and always in the *Vene Lactea* and *Thoracic Duct*, may be seen in the Commixtures of divers Liquids, which separated exhibit no such Appearance; nor is this *Phenomenon* any otherwise than a Transposition of Particles, whether by a *Menstruum* insinuating into them, dividing them into gross Globules, as an Acid into Sulphur, as Vinegar with Oil, &c. or else by Precipitation, as when a Gum-mous or Resinous Body is dissolved in a Spirituous *Menstruum*, and mixed with a Phegm; so Tincture of Myrrh and Benjamin, &c. make a milky Appearance in common Water,

The Longitudinal and Transverse Order of the Fibres of the Guts, are the Instruments by which the *Peristaltick* Motion of them is performed, which Motion is not only necessary for punishing their Contents forwards, but by reciprocal Contraction of the *Muscular* Fibres of the Guts, and Apposition of their *Connivent Valves*, the Mouths of the *Lacteals* are disposed to receive what is fitted for them; hence it is we can by no Means make any Fluid whatever pass from the Cavity or the Guts into those *Lacteal* Vessels in a dead Animal.

A further use of this Contraction of the *Muscular* Fibres of the Intestines, is to accelerate the *Chyle* in its Progress in the *Lacteals*, till the *Lympha* derived from the Extremities of the Arteries of the Guts joins with it; which Conjunction is made in the *Lacteals* before they leave the External Surface of the Intestines. By this Means the Progression of the *Chyle* is made towards the *Mesenterick* Glands, into whose Cells it is received, where it again mixes with a Juice brought in by the Arteries of each Gland; which Juice or *Lymphatick* Liquor not only farther dilutes the *Chyle*, like that from the Arteries of the Intestines, but adds a fresh *Impetus*, by which its Motion is farther carried on through the *Vasa Lactea secundæ generis*; (arising out of each *Mesenterick* Gland, and discharging their Contents into the *Receptaculum Chyli*.) Here the *Chyle* meets and joins with the *Lympha* sent through the *Lymphatick Ducts* from the inferior Limbs and neighbouring Parts, whereby the *Chyle* is not only farther prepared, but its Ascension is promoted in the *Thoracic Ducts*, whose several Divisions and Inosculation (like the Veins of the Testicles) with its many Valves looking from below upwards, and advantageous Situation between the great Artery and *Vertebre* of the Back together with the *Lymphatick* ducts, discharging their *Lympha* derived from the Lungs and neighbouring Parts of the Thorax, does demonstrate the utmost Art still used in order to its Ascension towards the left Subclavian Vein, where meeting with the reflux Blood of the Superiour Parts, its passes with it through the descending

descending Trunk of the *Vena Cava*, and joins with the reſluent Blood of the inferior Parts in the Right Auricle of the Heart; whence its expelled by its Contraction into the Right Ventricle, when the Heart is in *Diſtole*; but by the *Syſtole* or Contraction of the Heart, it's again driven out thence into the *Arteria Pulmonaris*, thro' whose Extremities, in conjunction with those of the *Vena Pulmonalis*, it paſſes to the Left Auricle and Ventricle of the Heart, from whence it's again expelled in the *Syſtole* (as above) into the *Aorta* or *Arteria Magna*, by whose Branches it's conveyed thro' the whole Field of the Body: The three tricuspid Valves in the Right, and two Mitral Valves in the left Ventricle of the Heart opposing its return into the Veins, and the Semilunary Valves of the *Arteria Pulmonaris* and *Aorta* preventing its Ingreſs into the Ventricles, are ſufficient (when rightly conſidered) to demonſtrate the neceſſity of a Circulation of this grand Fluid called Blood. Thus *Sanguification* is begun, and as we have mentioned the divers Preparations of the Aliment before Chylification, ſo here may be obſerved the various Mixtures and Preparations of Chyle in order to Sanguination.

CHYL *Receptaculum*: See *Receptaculum Chyli*.

CHYLIOSIS, the ſame with Chylification.

CHYMIA, or *Chemia*, is a Reſolution of mix'd Bodies in their Elements; and again, when it can be done, *Co-agulation* or *Redintegration* of the ſame Elements into the Bodies which they conſtituted before: There are two Parts of it, *Solution* and *Co-agulation*; by the Addition of the Arabick Article it is called, *Alchymia*, or *Alkymia*; it is called alſo *Spagyria*, *Hermetica ars*, *ars perfecti Magiſterii*, *ars Segregatoria*, *Separatoria* and *Deſtillatoria*. Blanchard.

CHYMICA, or *Chymicalia*, are Medicines which the Chymiſts prepare, that they may be taken in a leſs or more grateful Quantity. Blanchard.

CHYMISTRY, is variously defined, but the Deſign of the Art is to ſeparate uſefully the purer Parts of any mix'd Body, from the more Groſs and Impure. It ſeems probably to be derived from the Greek Word, *χυμος*, which ſignifies a Juice, or the purer Subſtance of a mix'd Body; though ſome will have it to come from *χέω*, to melt. It is alſo called the *Spagyrick*, *Hermetick*, and *Pyrotechnick Art*, as alſo by ſome *Alchymy*. The Reaſons whereof you may ſee under thoſe Words.

CHYMOSIS, or *Chemoſis*, is a Diſtortion of the Eye-lids, ariſing from an Inflammation; alſo an Inflammation of the *Cornea Tunica* in the Eye. Blanchard.

CHYMUS, the ſame with Chylus.

CHYRONIA, is a great Ulcer, and of different Cure.

CHYRURGERY, or, as 'tis now a-days pronounced and written *Surgery*, is the Third Branch of the Curative Part of Medicine, and teacheth how ſundry Diſeaſes of the Body of Man may be cured by *Manual Operation*. Some divide it into theſe five Parts. 1. *Syntheſis*, a ſetting together of things ſeparate. 2. *Diareſis*, a ſeparating of things that were continued before. 3. *Diorthotiſis*, a correcting of things ſqueezed together, and con-torted. 4. *Exereſis*, a taking away of Superfluities. 5. *Anaplerotiſis*, a reſtoring of that which was deficient.

CICATRISANTIA, are ſuch things as by drying, binding and contracting, fill up Ulcers with Fleſh, and cover them with a Skin. Blanchard.

CICATRICULA, is that little whitish Speck in the Coat of the Yolk of an Egg, in which the firſt Changes towards the Formation of the Chick appear in an impregnated Egg: 'Tis commonly called the *Tredde*. The Chick lodged in the *Cicatricula* is nourished only by the White of the Egg, till 'tis grown of a competent Largeneſs; the Yolk ſeeming to be reſerved by Providence for a more ſtrong and ſolid ſort of Aliment, which is ſitter for the Animal when grown greater.

CICATRIX, *Cicatrices*, Scars or Marks which are left after great Wounds or Ulcers: Some are Simple, others are accompanied with *Cavities*, Diminution or Excreſcence in the Parts affected.

CICATRINING Medicines: See *Cicatrifiantia*.

CILIA and *Supercilia*, are the Eye-brows, hard Cartilaginous Bodies; but *Supercilia* properly the Hair upon the Eye-brows, at the Extremity of the Forehead.

CILIARE Liganentum, or *Proceſſus Ciliaris*, is a Collection of ſmall ſlender Filaments which take their Riſe from the inner Part of the *Tunica Uvea* in the Eye, and thence run towards the Prominent Part of the Chryſtalline Humour, which they compaſs in and connect to the Uvea: Its uſe is to help, contract, or dilate the Figure of the Chryſtalline Humour, and to draw it farther from, or bring it nearer to the Uvea, according as occaſion ſerves.

CINCTURE, in Architecture, is that part which makes the middle of a Pillar; 'tis *Conge* in French; the Greeks called it *ἀμφοῦρος*, becauſe that Part of the Pillar taking as it were, a Riſe, ſeems to fly from the Baſis: It is no more than the Rings of Ferrils formerly uſed to preſerve Wooden Pillars from ſplitting, and which they afterwards imitated in Stone Work.

CINEFACTION, with ſome Chymiſts is uſed for Calcination.

CINERITIA, or *Subſtantia Corticalis*, is the External Subſtance of the *Cerebrum*; it is Soft, Glandulous, and of an Aſhy Colour. Blanchard. See *Cortical*.

CINNABAR, is a Mixture of Sulphur and Quick-ſilver ſublimed together, and is either Natural, when this Mixture is made in the Earth by Means of the Subterranean Heat, and then 'tis called *Native Cinnabar*: Or elſe, 'tis *Artificial*, which is thus made: The Sulphur is melted in a great Earthen Pan, and then is put into it by Degrees, thrice its Weight of Mercury, and the Mixture is ſtirred about till all the Quick-ſilver diſappears. After this the Mixture is cooled and powdered, and then ſublimed in Pots with an open Fire, a hard red Maſs will be raiſed, ſhaped like Needles. 'Tis browniſh when in the Lump, but being powdered finely, is of a very high red, and is called *Vermillion*. The chief Deſign of this Operation is to make the Mercury Portable; which 'tis not ſafely, when in its natural Form, becauſe of its great Weight and Fluidity.

Cinnabar is revived into Mercury, by mixing with it in Powder, three times as much Quicklime, and diſtilling in a Glaſs Retort, into a Receiver filled with Water, by Degrees of Fire; the Quick-ſilver will be found at the Bottom of the Receiver. You may receive Quick-ſilver alſo by mixing an equal

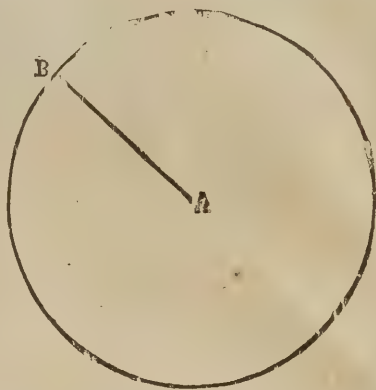
qual Quantity of Filings of Iron with the *Cinnabar*; and distilling as before.

CINNABAR of *Antimony*, is thus made: Fill a Retort half full of equal Parts of Powder of Antimony and Sublimate Corrosive; and setting the Vessel in Sand, proceed at first as in the making of *Butter of Antimony*, which will also this way be made. But when, the Fire being encreased, you find red Vapours begin to arise, fit on another Receiver, but without luting the Junctures, and raise the Fire by degrees till the Retort be red hot, in which State it must be kept three or four Hours. Then the Vessels being left to cool, break the Retort, and you will find, if the Operation succeed (which now and then it will not) the *Cinnabar* sublimed and adhering to the Neck of the Retort. 'Tis accounted a good Medicine for Epileptick and Cephalick Distempers.

CION, *Columella*, *Gargareen*, *Gurgulio*, *Uva*, *Uvula*, *Uvigena*, *Uviger*, *Epiglottis*, *Sublinguim*, is the Cover of the Wind-pipe; it hangs betwixt the two Glandules, called *Amygdalæ*, above the Chink of the *Larynx*, and is a Process from a Substance, as one would think, Glandulous, Spungy, and red; which *Columbus* is of Opinion, arises from the Tunick of the Mouth, redoubled in that Place. But *Riolan* says, it proceeds from some Muscles which are terminated there. It is of a Figure roundly oblong, in the upper Part thicker, and ending acutely. Its use is to temperate the Coldness of the Air, and hinder the Drink from falling upon the Nostrils: Sometimes this *Uvula* sticks out too far, from the Humours that fall upon it, which cannot return by the *Lymphatick Vessels*, whence proceeds the falling of the *Uvula*, which we call *Roof of the Mouth*. *Blanchard*.

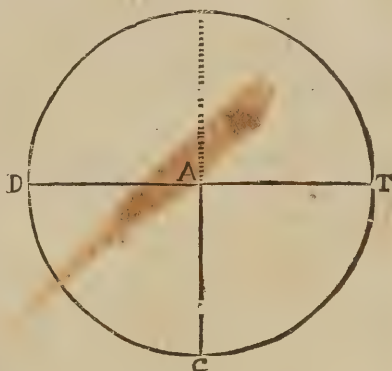
The *Uvula* is moved by two Pair of Muscles, the *Pterigopharyngeus Externus*, and *Internus*; (which see) and the former of these draws the *Uvula* backwards, and the latter plucks it forwards, because of the Pulley through which its Tendon passes, and which alters the Direction of its Motion; both which Motions are necessary for Deglutition, for the Articulation of the Voice, as well as to hinder any Drink, &c. from going into the Nostrils.

CIRCLE, is a Plane Figure bounded with one only Line, and to which all the Right Lines that can be drawn from a Point in the Middle of it are equal to one another. And it may very well be supposed to be made thus; If you imagine the Line *AB* fastned at one End to the Point at *A*, but yet so as to be moveable on *A* as a Center, till the End *B* arrive at the Place where it began; the Line *AB* in its Motion describes a Figure, called a Circle, and the Point *B*, at the same time, describes a Curve Line, called the Circumference of a Circle.



From which *Genesis* 'tis plain, That all Right Lines drawn from the Point *A* (which is called the Center) to the Circumference, must be of equal length, or be equal to one another. And these Lines are called *Radius*, and by some *Semi-Diameter*.

The Line *DT* passing through the Center, and terminated at each End by the Circumference, is called the *Diameter*, and its half the *Semi-Diameter* or *Radius*.



These *Diameters* are all equal to one another, and do divide the Circle into two equal Parts which are called *Semicircles*.

Any Part of the Circumference of a Circle is called an *Ark*, which *Ark* is the Measure of any Angle, whose Vertex or Angular Point is at the Centre of that Circle.

Every Circle is supposed to be divided into 36 equal Parts, which Parts are called *Degrees*; of these a *Semicircle* contains 180, and a *Quarter* of a Circle 90, which is called a *Quadrant*, as *CT*.

To find the Superficial Content of any Circle, see *Area* and *Polygon*; where the Ground of the Practice is demonstrated. And since 'tis there proved from *Archimedes*, that a Circle is equal to a *Rectangle Triangle*, one of whose Sides is the *Radius*, and the other the *Periphery* (or a Line equal to it.) Let the *Radius* be called $\frac{1}{2}d$ (supposing *d* to be the Diameter) and whatever the unknown Ratio of the *Periphery* be to the Diameter, let it be expressed by *r*: Then will the *Periphery* be *r d*; and conse-

consequently the Perpendicular rd being multiplied by half a Radius, that is, by $\frac{1}{2}d$, the Product will be $\frac{1}{2}rd = \text{Area of the Circle}$ (because of the Triangle.)

From which way of Notation may it be presently proved, That Circles are to one another as the Squares of their Diameters.

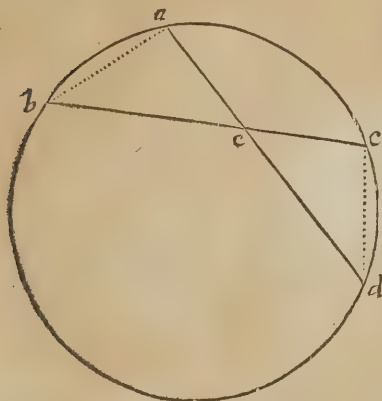
For let the Diameter of one Circle be d , and of the other D ; then their Areas will be $\frac{1}{4}rd$ and $\frac{1}{4}rDD$, where $\frac{1}{4}r$ being a common Efficient or Multiplier, alters not the Ratio; for no doubt $\frac{1}{4}rd : \frac{1}{4}rDD :: d : DD$. Q. E. D.

Proposition I.

The Parts of any two Chords cutting each other in a Circle, are Reciprocally Proportional.

That is, $ae : eb :: ec : ed$.

— Draw ba and cd .



Demonstration.

1. The Triangles aeb and ced are similar, because the Angles at e are equal, and $a = c$, because in the same Segment; therefore the Sides about the equal Angles are Proportional, that is, $ae : ab :: ec : ed$. Q. E. D.

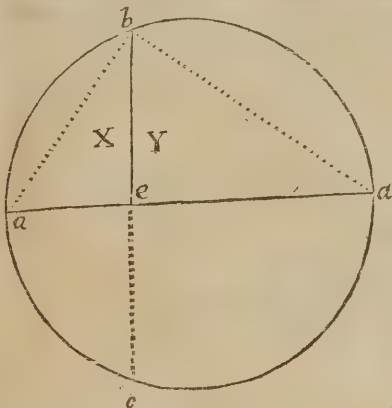
Coroll. 1. Hence, if two Chords cut each other, the Product made by the Multiplication of the Parts of one Chord, is always equal to the Product of the Parts of the other:

That is, the \square of the Extremes $aed = \square$ of the mean Terms bec .

Coroll. 2. If one Chord (ad) be a Diameter, and the other (bc) cut it Perpendicularly; then is be , or its equal ec , a mean Proportional between the Parts of the Diameter ae and ed .

For if you imagine the Lines ab and bd to be drawn, the Triangles x and y will be similar, and therefore $ae : eb :: eb : ed$. And then the

$$\square aed = \square eb.$$



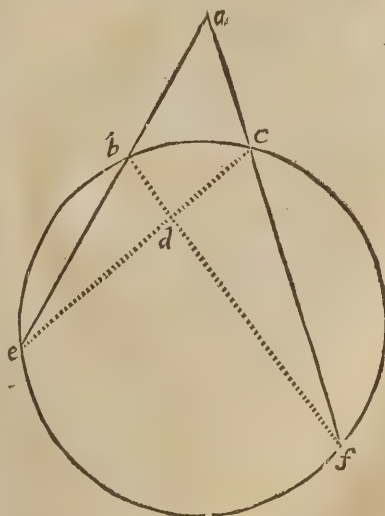
And this may be called the General Property of the Circle arising from the Nature of the Curve.

And if you call the Diameter of the Circle $2r$ (because the Radius is $= r$) and consider it as the Axis of a Conick Section; the Part ae in the Figure, will be the Abscissa or intercepted Ax proper to the Ordinate be , wherefore calling, as is usual, the Abscissa x , and the Ordinate y , this general Property of the Circle will be thus expressed $2yx - xx = yy$; for ae being x , ad must be $2r - x$; and that multiplied by x , gives $2rx - xx$ which must be equal to $\square ba = yy$.

Proposition II.

If two Lines (as af and ae) from a Point (a) without a Circle, be draw to its Circumference within (as to e and f) the Rectangles made by those Lines and their External Parts shall be equal.

That is, $\square eab = \square fac$. Or those Lines are to each other reciprocal in a Proportion of their External Parts, $ie, ae : af :: ac : ab$.



Draw bf and ec : Then are the Triangles $eaec$ and $abfec$ equiangular, for the $\angle f = \angle e$ being in the same Segment, and a is common.

Therefore $ac : ac :: af : ab$, and then alternately $ac : af :: ac : ab$.

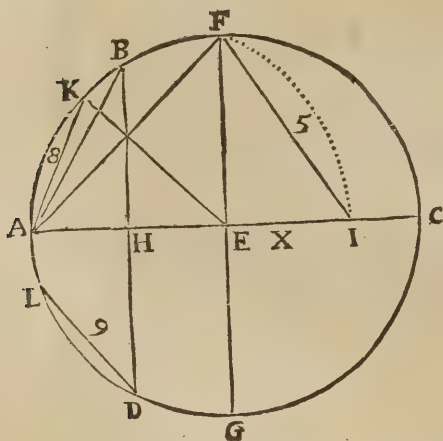
Therefore $ac \times ab (= eab) = fa \times ac (= fac)$ Q. E. D.

Problem I.

To divide the Circumference of a Circle into any number of Parts not above 10.

Suppose the Circle $ABCD$ were to be divided.

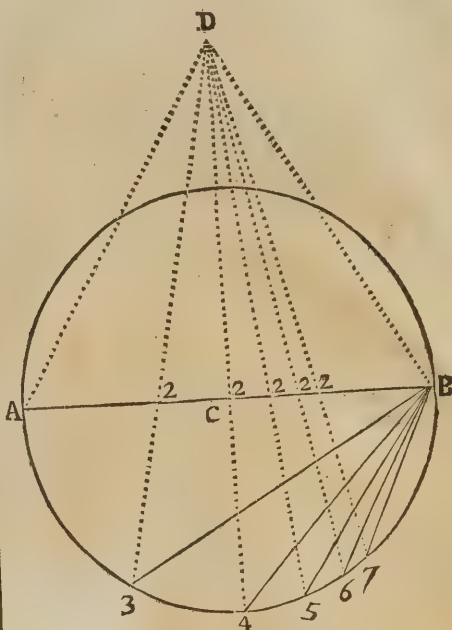
1. The Diameter AC divides the Circle into two equal Parts.
2. The Radius AE being made the Chord, AB is the Side of the Hexagon inscribed by 15 *e*.
4. *Eucl.* Therefore.
3. The Line BD is the Side of an Equilateral Triangle.
4. And AF the Side of a Square inscribed.
5. With the Distance HF describe the Ark $F I$; the Right Line FI is the Side of a Pentagon inscribed. 10 *e*. 13. *Eucl.*
6. The Line $BH = DH$ is the Side of the Heptagon.



7. The Line AK (which is the Chord of half the Ark AF) is the Side of an Octagon inscribed.
8. The Line DL (which is $\frac{1}{3}$ of the Arch BAD) is the Side of a Nonagon.
9. The Line $E I$ is the Side of a Decagon.

Problem II.

To divide the Circumference of a Circle into any number of equal Parts.



Upon the Diameter AB (of the given Circle) make an Equilateral Triangle ABD , and divide the Diameter AB into as many equal Parts as you design there shall be Sides of the Polygon to be inscribed, or as the Circle is to be divided into; and omitting two, *e.g.* from B toward A , draw thro' the beginning of the third from D , a Right Line, to the opposite Concave Circumference, and thence another Right-Line to the end of the Diameter B .

Thus, *e.g.* to Divide the Circumference into three equal Parts, Divide the Diameter AB into three equal Parts; and then omitting two of them through the beginning of the third, or thro' $B 2$ draw the Right Line $D 3$; and from 3 the Line $3 B$, which last will be the Side of the Triangle to be inscribed; so $4 B$ will be the Side of a Square, $B 5$ the Side of a Pentagon, $B 7$ of an Heptagon, &c.

The Plane of any Circle may be considered as made up of an infinite number of Concentrical Peripheries, encreasing from the Center in Arithmetical Proportion; wherefore a Rank of such Peripheries will be to a like Number equal to the greatest, as 1 to 2. Wherefore the Area of a Circle is to the Surface of a Cylinder, whose Height is equal to the Radius, and its Base that Circle, as 1 to 2. And consequently, if the Height of the Cylinder had been equal to the Diameter of the Circle (which is the case of the Cylinder circumscribing a Sphere) the Curve Surface of the Cylinder would be equal to 4 times the Base of it (*i.e.* the Surface of a Sphere is quadruple to the Area of one of its great Circle: for the Surface of the Sphere is equal to the Curved Surface of such a Cylinder; as is proved elsewhere. See Cylinder.

The Proportion of the Periphery of a Circle to its Diameter is less than $3\frac{1}{7}$, and greater than $3\frac{1}{8}$ to 1.

The Area of any Circle to the Square of its Dia.

Diameter :: is as $\frac{1}{2}$ of the Periphery to the said Diameter, as is proved under *Cylinder*.

The Area of any Circle is incomensurable to the Square of the Diameter; and so, is also the Periphery to the Diameter: See *Sturmius's Mathes. Euclear. Prop. 43*.

CIRCLE Equant, in the *Ptolemaick Astronomy*, is a Circle describ'd on the Center of the *Equant*; its chief use is to find the Variation of the first Inequality.

CIRCLE of perpetual Apparition, is one of the lesser Circles parallel to the *Equator*, being describ'd by any Point of the Celestial Sphere which toucheth the Northern Point of the *Horizon*, and carried about with the Diurnal Motion. All the Stars that are included within this Circle never set, but are always visible above the *Horizon*: And the

CIRCLE of perpetual Occultation, is another Circle at a like distance from the *Equator*, and contains all those Stars which never appear in our Hemisphere. But the Stars situated between these Circles incessantly rise and set at certain times.

CIRCLES of Altitude: See *Almicanters*.

CIRCLE of Declination on the Globe; So some Writers call the Meridians on which the Declination or Distance from the *Equator* of any Planet or Star is accounted.

CIRCLES of Longitude, on the Globe, are great Circles passing thro' the Star and the Pole of the *Ecliptick*, where they determine the Star's Longitude, reckon'd from the beginning of *Aries*. On these Circles are accounted the Latitudes of the Stars.

CIRCLES of Position, are Circles passing by the common Intersections of the *Horizon* and *Meridian*, and thro' any Degree of the *Ecliptick*, or the Center of any Star, or other Point in the *Heavens*; and are used for the finding out the Situation or Position of any Star, &c.

CIRCUITY of Action (in Law) signifies a longer course of proceeding than is needful, to recover the thing sued for.

CIRCULAR Numbers, or *Spherical ones*, according to some, are such whose Powers terminate in the Root themselves.

As for Instance, 5 and 6, all whose Powers do end in 5 and 6, as the Square of 5 is 25, the Square of 6 is 36, &c.

CIRCULATE, Circulation, in Chymistry, signifies the giving a Motion to Liquors contained in a double Vessel (that is, when the Necks of two Vessels are excellently well luted one into another) excited by Fire and causing the Vapours to ascend and descend to and fro; which Operation is intended either to subtilize the Liquors, or else to open some hard Body that is mingled with them. The circulating Vessel is sometimes called a *Pelicans*, or a blind *Alambick*.

CIRCULATION of the Blood, is that Motion of it which is produced by the continual Reciprocal of the Pulse; whereby there is a constant Expulsion of the Blood from the Heart into the Arteries, and as constant and continual an Influx of Blood into it out of the *Cava*; and seeing the *Vena Cava*, from whence the Supply comes, is never drawn dry; nor on the other Hand, the Arteries which receive the Blood from the Heart continually, are unduly swell'd with it; it must necessarily follow (as our great *Harvey* first plainly proved) that this Motion proceeds circularly, and that the Blood is continually driven out of the

Heart into the Arteries, and out of these into the Parts to be nourish'd; from whence it is reformed by the Capillary Veins, which carry it into the larger, and these into the *Cava*, from whence it returns to the Heart again. The Reasons enforcing the Necessity of a Circulation of the Blood are these.

1. The great Quantity of Blood that is driven out of the Heart into the Arteries at every Pulse. For tho' the Ancients who knew not this Circulation; imagin'd, that only a drop or two was expell'd by every *systole*, which they were necessitated to suppose, to avoid the great Distention that the Arteries must be liable to, if any considerable Quantity issued into them; yet it is certain and demonstrable, that there must needs an Ounce, or more, be driven into them each time: For (taking it for granted, that there is no other way for any Liquor to pass from the Stomach to the Kidneys but thro' the Heart, along with the Blood) seeing if some Men at some times drink three Pints of Drink, they shall piss it out again in half an Hour, yea more of *Tunbridge Water* in that space: And seeing, Secondly, that there is commonly as much Blood as Serum, that flows to the Kidneys (the Blood returning back by the Emulgent Veins) it is clear, that by the two Emulgents (which are none of the largest Arteries) there must pass in half an Hour 6 Pounds of Liquor, all which must come from the Heart; and how much more then may we conceive to be driven thro' all the other Arteries that run thro' the whole Body? This is most accurately evinced by Dr. *Fouler's* Experiment, which is this; "I cut *Asper's* (says he) both the *Cervical Arteries* in a large Dog, and at the same time thro' an Hole made in the left side of his Breast over-against the Heart, I compressed the Trunk of the *Aorta* below the Heart with my Finger, to hinder any Blood from descending by it; and, lastly, I took care also to straiten the *Brachial Arteries* under the *Axilla*, by which means almost all the Blood was driven out of the Heart thro' the *Cervicals* (besides that which was sent into the *Vertebrales*) and which is wonderful to be related, within the twentieth part of an Hour the whole Mass issued out; so that it is not to be denied, but that all passes thro' the Heart in that space. And tho' it may be granted, that amidst such Wounds and Tortures the Heart does beat somewhat quicker than at other times; yea the same thing is partly evident from Wounds in the Limbs when some notable Artery is cut asunder; for 'tis strange in how small a time a Man will bleed to Death even at that one great Artery: Yet we may give a guess how much Blood is sent out of every Pulse, even from ordinary opening of one Vein in the Arm, from whence a notable quantity of Blood will issue in a short time, how much then may we suppose would flow out of all the Veins, if they were open'd at one time? Seeing then 'tis evident so great such a quantity of Blood is expell'd out of the Heart at every *Systole*, and that for all that the Arteries are not unduly distended, nor any part swell'd by it, neither yet the *Cava* and other Veins emptied; 'tis certain that the Blood that is driven into the Arteries flows back to the Heart by the Veins in a constant Circulation.

2. A second Argument to prove it, may be taken from the Valves in the Veins, which are so framed that Blood may freely flow thro' them out of the lesser Veins into the greater (and so into the

Cava) but not on the contrary, out of the greater into the less. Yea, if one blow into the *Cava* thro' a Pipe, there will no Wind pass into the smaller Veins; but on the contrary, if you blow up the lesser Veins, the Wind will readily pass to the larger, and so to the *Cava*.

3. And lastly, the same thing is most clear by the Ligature in Blood-letting: For whether you let Blood in the Arm or Foot, you always tie the Fillet above where you intend to make the Orifice, and then the Vein below the Ligature will presently fill and grow tumid, but above it will fall and almost disappear; which must needs be from hence, for that the Blood being driven along the Arteries towards the extrem parts, returns by the Veins, and ascends upwards, which coming to the Ligature, and being stop'd there, swells the Vein below the Ligature, and spurts out as soon as the Orifice is made; but when the Fillet is loos'd again, the Blood flows no longer out thereat, but holds on its wonted Channel, the Vein and the Orifice closes up again.

Having sufficiently demonstrated the Circulation of the Blood, we will shew two things farther; *First*, How the Blood passes out of the Arteries into the Veins; and, *Secondly*, in what time it may be supposed to pass thro' the Heart in its ordinary Circulation.

As to the *first*, it was the Opinion of *Riolanus*, that the Blood circulated only thro' the larger Vessels, by Anastomosis or Inoculation of the Veins with the Arteries; and that that which run into the smaller, was all spent on the Nutrition of the Parts. But it is clear, that there must be a Circulation even in the smallest, from the great quantity of Blood that will flow out of the least Artery in the Hand or Foot when it is cut; which it were very absurd to imagine to be all spent on the nourishment of the respective Parts. Now there are but two ways whereby the Blood can be supposed to pass out of the Arteries into the Veins, *viz.* either by the former's being continued to, or opening into the latter by Inoculation, or else by the Capillary Arteries letting out their Blood into the Pores of the Substance of the Parts, on whose Nutrition part is spent, and the Remainder imbibed by the gaping Mouths of the Capillary Veins. That it is necessary to admit of this latter way, is evident, because if part of the Arterial Blood did not issue into the Substance of the Parts, they could not be nourish'd by it; for while it is in the Vessels, it may add Warmth indeed to the Parts thro' which it flows, but cannot nourish them, seeing even the Vessels themselves are not nourish'd by that Stream of Blood that glides along their Cavity, but by Capillaries running thro' their Coats; and if the Blood be driven into the Substance of the Parts, and that in a greater quantity than suffices for their Nourishment (as was just now shewn that it is) what is superfluous must needs enter the Mouths of the Capillary Veins, from which it goes forward to the larger, and so to the Heart: But seeing this way of transfusing the Blood thro' the Substance of the Parts, has seem'd to some not to answer to that hasty Circulation of it as above demonstrated; they have thought it necessary also to admit of the former way, namely, Anastomoses, by which the Veins are continued to the Arteries, and that not only in their larger Branches (as that notable one of the Splenick Artery with the Splenick Vein) but also in their smaller Twigs in the extreme

Parts. But we must consider, that in a living Body the solid Parts are infinitely more porous and permeable than in a dead; so that tho' the Anatomists find their Substance so dense and close, as to make it seem almost impossible they should permit so quick a passage to the Blood thro' them, yet they should rather believe it, than suppose such Anastomoses as they cannot discover (tho' it were not difficult to find them out if they had an Existence;) for abating the single one of the Splenick Artery with the *Ramus Splenicus* of the *Porta* (and perhaps some of the Arteria with the *Vena Pulmonaris* in the Lungs) none of the latest most accurate Anatomists have been able to find out any. And as for that mentioned, it seems rather to be of an Artery with an Artery (such as are frequent in several Parts of the Body, as are also of one Vein with another) than of an Artery with a Vein; for the *Porta* from which this *Ramus* is propagated, is generally reputed rather an Artery than a Vein.

And, *Secondly*, as to the Space of Time in which the whole Mass of Blood may ordinarily circulate thro' the Heart, it is probably much shorter than many have imagin'd. For supposing that the Heart makes 2000 Pulses an Hour (which is the least Number any spoke of, and some have told twice as many) and that at every Pulse there is expelled an Ounce of Blood (which we may well suppose, seeing the Ventricles are wide enough to contain 2 Ounces; and that it is probable also, both that they are filled near full in the *Diastole*, and that they are near, if not quite emptied by the strong Constriction of the Heart in the *Systole*) seeing the whole Mass usually exceeds not four and twenty Pound, it will be circulated six or seven times over thro' the Heart in the Space of an Hour. And by so much the oftner, by how much the Blood comes short of the supposed Quantity, or the Pulse either naturally, or by a Fever, Spirituous Liquors, or violent Motion is rendred more frequent. By which quick Motion the Blood it self is kept from Coagulation and Putrefaction, and the Parts are cherish'd with vital Heat, which Heat of the Parts is much according to the Slowness or Rapidity of the Circulation: So when we sit still, and the Pulse is slow or rare, we grow cold; but when upon running, or any other violent Exercise the Pulse becomes more frequent and quick, we become hot.

CIRCULATORIUM, is a Glass Vessel, wherein the Liquor infused by its ascending and descending, rolls about as it were in a Circle: There are several sorts of these Vessels, but two especially of moment and use, that called *Pelicanus*, and the other *Diora*: Which see; as also *Double Vessel*.

CIRCULUS, is a round Instrument made of Iron, used by Chymists for the cutting off the Necks of Glass Vessels; which is perform'd thus; The Instrument being heated is apply'd to the Glass Vessel, and is there continued till it grow hot; then with some drops of cold Water, or a cold Blast upon it, it flies in pieces. This way they cut off the Necks of Retorts or Cucurbits.

CIRCUMAGENTES Musculi, are certain oblique Muscles of the Eyes, so called from their helping to wind and turn the Eyes round about.

CIRCUMAMBIENT: See *Ambient*.

CIRCUMFERENCE, is the outermost bounding Line of any Plane Figure, but it more properly belongs to the Perimeter of a Circle; as is apparent

parent from the Genesis of a Circle. See Circle.

CIRCUMFERENTER, and Instrument used in Surveying, being the same with the *Theodolite*: Which see.

CIRCUMFLEX *Accent*, in Grammar, is composed both of the *Acute* and the *Grave*, and it's expressed thus (A).

CIRCUMGYRATION, is the wheeling Motion of any Body round a Center.

CIRCUM-POLAR Stars, are such Stars as being pretty near our *North Pole*, do move round it, and in our *Latitude* never set, or go below the *Horizon*.

A TABLE of Circum-Polar Stars.

Magnetic Declination.	Names.	Right — A. Ascension in Time under the Pole- Star.	Difference in Time between the Pole-Star and the Pole.	Azimuth un- der the Pole- Star	Colong.
		H. M. S.	H. M. S.	D. M. S.	
1	Upper follow- er in □	00 03 53	00 04 26	37 12	E
3	Penult in Dra- gon's Tail.	00 20 11	00 03 15	19 12	E
2	Cor Caroli	00 36 4	00 00 05	00 54	E
2	Aliot.	00 39 25	00 01 14	02 02	W
2	Middle Great Bear's Tail	01 07 02	00 03 44	33 00	W
2	Tip of his Tail	01 28 56	00 05 45	57 00	W
2	Antepenult. in Dr. Tail	01 47 40	00 10 58	16 48	W
2	Upper Guard of the little Bear	02 26 05	00 24 10	55 48	W
3	Lower Guard	02 57 15	00 26 52	24 36	W
3	Draco, 27. in Tycho's Cata- logue.	02 59 45	00 18 0	27 00	W
3	—26—	03 35 17	00 21 04	55 48	W
3	—25—	03 54 54	00 24 35	10 12	W
3	—24—	04 36 43	00 30 49	34 48	W
3	—20—	03 58 34	00 30 43	12 36	W
2	First in his Head	04 59 30	00 23 4	45 00	W
2	Bright one in the Head	05 25 01	00 24 11	53 24	W
1	Lucida Lydra	06 05 34	00 20 30	00 36	W
3	N. in Draco's upper Turn	06 37 04	00 35 4	01 12	W
3	South in its upper Turn	07 11 21	00 37 56	56 24	W
2	Swan's upper Wing	07 13 26	00 21 45	56 24	W
3	Star in her Breast	07 51 26	00 19 26	45 00	W
3	—in her Tail	08 10 30	00 19 59	37 12	W
1	Cepheus's right Shoulder	08 45 35	00 25 02	18 36	W
3	—Girdle	08 53 30	00 30 44	13 48	W
3	—Knee	11 10 00	00 17 55	25 48	W
3	Cassiopea's Chair	11 46 07	00 05 54	51 00	W
3	—Breast	12 20 48	00 01 50	16 48	W
3	Star in the Hip	12 37 50	00 00 02	00 10	W
3	—in her Knee	12 08 45	00 02 41	31 12	E
3	—in her Leg	13 39 38	00 07 53	01 12	E
2	Foot of Androm- eda	13 50 37	00 06 19	12 00	E
3	Medusa's Head	14 59 14	00 11 45	13 48	E
2	Bright Star in his Side	15 14 59	00 14 2	26 24	E
3	Capella in Au- riga	17 13 55	00 20 45	40 48	E
1	—in his right Shoulder	17 58 07	00 21 55	55 12	E
3	N. in Gr. Bear's right Foot	20 50 49	00 20 52	28 12	E

The Table continued.

	H. M. S.	H. M. S.	D. M. S.	
3 y. in the same Foot	20 55 23	00 20 13	3 21 00	E
3 —in the left Knee	21 24 15	00 19 57	3 07 12	E
2 Lower Leader in the □	22 54 50	00 12 57	1 50 24	E
2 Upper Leader	22 57 59	00 14 20	1 47 24	E
3 Last in Dra- co's Tail	23 24 13	00 13 36	1 20 24	E
2 Gr. Bear's left Thigh	23 43 36	00 06 48	0 59 24	E

N. B. □ stands for 4 Stars in Charles's Wain.

The Use of this Table.

1. For the Hour of the Night.

In a *North Widow* (or any convenient Place) hang up a fine String with a weighty Plummet, and placing your Eye at some distance (backward) mark when any Star in the Table comes to your String, so that it cut both it and the *Pole-Star* together; then from that Star's *Right Ascension* (in the Table) take the *Right Ascension* of the Sun (adding 24 Hours to the Star's (if need be) the Remainder is the exact Time of the Night.

N. B. The Stars mark'd with *W.* in the last Column, come under the Pole after they have been in the Vertical of the *Pole-Star*, when they are *West* of the Pole.

2. To find a true Meridian.

Place a second Line and Plummet behind the former (which was for the Hour) and having by the former observed when any Star in the Table comes to a Perpendicular with the *Pole-Star*, then count (by a Pendulum Clock or Watch) the difference in Time expressed in the second Column, and belonging to the Star you observe; then at the Moment when the Account is up, bring the two Strings and the Star all in a Right-Line, and then your two Strings are in the *Meridian*.

The two last Columns serve for the same use.

For when any of these Stars are under the *Pole-Star*, making the two Strings cut both the *Pole-Star* and the other; these two Strings hang so far out of the *Meridian Line*, as is the *Azimuth* expressed in the Table; which *Azimuth* is shewn to be *East* or *West*, as in the last Column.

N. B. There are 3 Stars in the Table, which being under the *Pole-Star*, are insensibly near the *Meridian*, viz. *Cassiopeia's Hip*, *Cor Caroli*, and *Alioth*; so that when they are under the *Pole-Star*, a *Meridian* may be found (very near) by one Thread.

Observe also, That there is just four Hours (wanting only one Second) between the coming of *Cor Caroli* and the 24th Star of *Draco* (in *Tycho's Catalogue*) under the *Pole-Star*.

CIRCUMSCRIBED; in Geometry a Figure is said to be *Circumscribed*, when either the Angles, Sides or Planes of the outward Figure, touch all the Angles of the Figure that is inscribed.

CIRCUMSCRIPTION, in Natural Philosophy, is the Termination or certain Bounds or Limits of any Natural Body. They make it either *Internal*, which belongs to the Essence and Quantity of every Body, whereby it hath a certain determinate Extension, Bounds and Figure: Or *External*, which they call also *Local*, because it is referred to the Place within which any Body is confined; for a Body is said to be *Circumscribed Locally*, or to be in a Place *Circumscriptively*, when it hath a certain and determinate *Ubi* or Place; in respect of the *Circum-Ambient* Bodies.

CIRCUMVALLATION, or the *Line of Circumvallation*, in Fortification, is a Trench bordered with a Parapet, dug round about the Besieger's Camp, within Cannon-shot of the Place, to hinder the Relief of the Besieged, and to stop Deserters: It is usually flank'd at the Distance of a Musket-shot with *Redoubts* and other small Works, or with Field Forts raised upon the most eminent Posts: Care must be taken never to draw a *Line of Circumvallation* at the Bottom of a rising Ground, lest the Enemy, having seized on the Station, inould plant Cannon there, and by that Means command the Line. This Line is usually about seven Foot deep, and twelve broad.

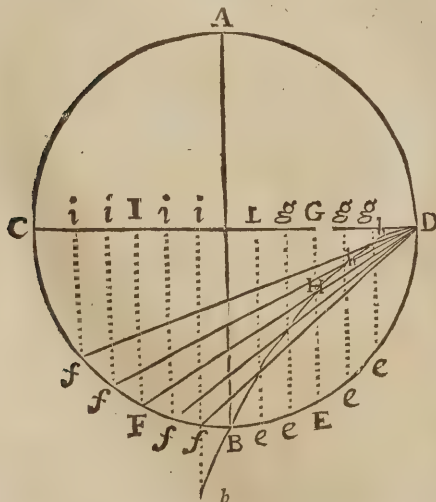
CIRRI, in Botany, are those fine Strings or Hairs by which some Plants fasten themselves in order to their Support in their creeping, as Ivy, &c.

CIRSOCELE, is a Swelling of the preparing Vessels about the Testicles, so that they sometimes look like a Third Testicle. *Blanchard.*

CIRCOS or *Varix*, is a Dilatation and Swelling of the Veins, crooking or winding, and arising in one or more Parts of the Body, insomuch as the Veins threaten a Rupture. *Blanchard.*

CISSOID, the Name of a Curve Line invented by *Diocles*, and thus produced or generated.

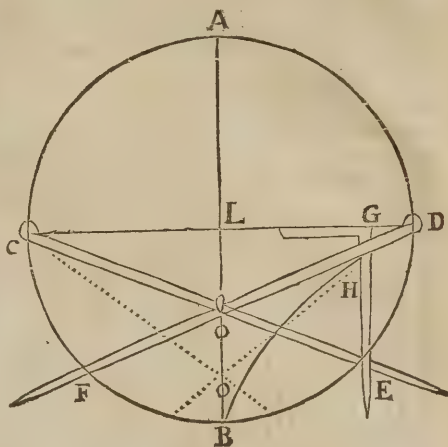
Let there be two Diameters of a Circle *A B* and *C D* cutting one another at Right Angles.



From *B* take equal Arks, as *Be* and *Bf* or *BE* and *BF*; and then from *e* or *E*, &c. erect the

Perpendiculars *eg* or *Eg*. Then draw the Transverse Lines *Df* and *DF*, &c. cutting those Perpendiculars in *H* and *b*, &c. by which Means you may find as many Points as you please in those Perpendiculars, through which to draw the Curve *D b A b B b* (which may be continued below the Circle if you please.) And this is called the *Cissoid*.

A Way to describe which Curve Organically the Second Figure represents.



Where two Rulers being fastened at *C* and *D*, and moveable upon those Points, intersect one another, as at *O*, or in *B*; and then a Square, as *LGE*, being so placed that *GE* and *LB* are coincident; as also the three Points *O*, *B* and *E*, if the two Rulers be moved upwards, so then the intersecting Point *O* begins to ascend, and the Square at the same time moves upwards also, with its upper Leg *LG* always parallel to *CD*, the Intersection of the Point *H*, or Angle of the Square with the Rule *FD* shall, in its Ascent, describe the Curve *BHD*, which is the true *Cissoid*.

Proposition.

If from any Point of the Diameter *CD* (See Fig. I. above) as from *G*, you draw a Perpendicular, as *GE*, through the Cissoid, the Lines *CG*, *GE*, *GD* and *GH* will be continually proportionable.

Demonstration.

The Lines *GE* and *IF* being Right Sines, and also *GD* and *IC* being versed Sines of equal Arks, will be equal; wherefore because of the Circle, *DI* : *IF* (i.e. *CG* : *GE*) : : *IF* : *IC*; i.e. *GE* : *GD*. But by Similar Triangles, *DG* : *GH* : : *DI* : *IF* (that is, as *CG* : *GE*;) so is *CG*, *GE* : : *GE*, *GD* : : *GD*, *GH*; that is, those Lines are all in continual Proportion. *Q. E. D.*

How by the Help of his Curve to find two mean Proportionals; see *Sturm. Math. Emuleus*, Prop. 21. of Book 2. and *Conf. 1.*

CITADEL, is a Fort of 4, 5 or 6 Bastions, built somewhere near a City, that it may command it in Case of a Rebellion; so that the City is not fortify'd on that Part against the Citadel, tho' the Citadel is against the City. The most usual Form

Form for *Citadels* is that of a Pentagon, a Square being too weak, and an Hexagon too big.

CITTA, or *Pica*, is a depraved Appetite, when People long for those things which are not fit to be, nor never are eat, as Lime, Coals, Shells, Cloth, Hides, Sand, *etc.* *Blanchard.*

CIVIL-DAY: See *Day*.

CIVIL-LAW, is properly the peculiar Law of each State, Country or City: But what we usually mean by the *Civil-Law*, is a Body of Laws composed out of the best of the Roman and *Grecian* Laws, and which was in the main received and observed throughout all the Roman Dominions for above Twelve Hundred Years. The Romans took the first Grounds of this Law from the Twelve Tables, which were Abridgements of the Laws of *Solon* at *Athens*, and of other Cities in *Greece*, famous for Knowledge and Wisdom, to which they added their own ancient Customs of the City of *Rome*. These written Laws were subject to various Interpretations, whence Controversies arising, they were determined by the Judgment of the Learned; and these Determinations were what they first called *Jus Civile*, after their several Cases were composed, which, lest the People should make them at pleasure, were fixed certain and solemn; and this Part of their Law they called *Actiones Juris*, *Cases at Law*: And by the bye, the Romans had also their *Plebiscita*, which were Laws made by the Commons without the Authority of the Senate. The *Jus Honorarium*, which was an Edict of some particular Magistrate; the *Senatus Consultum*, which was an Ordinance made by the sole Authority of the Senate; and the *Principalis Constitutio*, which was Enacted by the Prince or Emperor. These Laws grew by degrees to a vast number of Volumes; and therefore the Emperor *Justinian* commanded his Chancellor *Tribonian*, with the Assistance of the other Eminent Lawyers of that Time, to reduce it to a perfect Body. *Suidas*, and some others reflect on *Tribonian's* Learning and Integrity in this great Work; but no one can excuse his Haste and want of Care, for he did that in Three Years time, which the Emperor faith (in the Constitutions) he could not have imagin'd would be effected in less than Ten. For this Law had now been in practice above 1000 Years, and the Volumes of it were swelled to the prodigious Number of 2000, which 'twas impossible for *Tribonian* to read over in that time, much less to compare and digest them well. However this Body of Law is called the *Digests* or *Pandects*.

This Body of the *Civil-Law* is divided into three Volumes, which are still remaining; viz. the *Pandects* or *Digests*, the *Code*, and the *Institutes*: Which see. Afterwards to these were added the *Authenticks*, or *Constitutions* of *Justinian*, called also *Novellæ*: Which see, also under the Word *Authenticks*.

CIVIL-YEAR, is the Legal Year, or Annual Account of Time, which every Government appoints to be used within its own Dominions; and 'tis so called in contradistinction to the *Natural Year*, which is measured exactly by the Revolution of the Heavenly Bodies.

CLAMEA *admittenda in Trinere Attornatum*, is a Writ whereby the King commands the Justices in *Eyre* to admit of one's Claim by Attorney that is employed in the King's Service, and cannot come in his own Person.

CLAMPS, in a Ship, are those thick Timbers which lie fore and aft, under the Beams of the first *Orlope*, bearing them up at either End; and are the same that the *Risings* are to the Deck.

CLARETUM, amongst the foreign Writers of Pharmacy, is an Aromatick Wine, impregnated with an Infusion, and sweetned with Sugar; it is otherwise called *Vinum Hippocraticum*, *Hippocras Wine*; also *medicated Wine*: It is so called because it's percolated and purified by a Wine Sack or Bag, through which it is drained from its Dregs. And this Bag is called *Manica Hippocratis*.

CLARIFICATION, is the way to make Juices or thick Decoctions become clearer and finer, which is done three ways; by letting the Dregs subside of themselves, by Fermentation, or by the Addition of Vinegar, White of an Egg, or Milk, *etc.* either to precipitate the Dregs to the Bottom, or gather them in a Skum.

CLARICATIO, so the *Civilians* call *Aresto facto super bonis mercatorum alienigenorum*: Which see.

CLARION, a bearing in Heraldry of the following Figure; Ruby 3 *Clarions* *Topaz*, being the Arms of the Earl of *Bath*, by the Name of *Greenwile*. *Guillim* takes these *Clarions* to be a kind of old fashioned Trumpet; but others think they rather represent the Rudder of a Ship; or as some say, the Rest for a Lance.



CLASPERS, the twisted Ligaments or Threads with which certain Herbs or Shrubs, such as *Briony* and *Vines* takes hold of Trees or Plants that grow about them.

These *Claspers* are of a Compound Nature, between that of a Root and a Trunk. Their Use is sometimes for Support only, as in the *Claspers* of *Vines*, *Briony*, &c. whose Branches being long, slender and fragile, would fall by their own and their Fruits Weight; but these *Claspers* taking hold of any thing which is at Hand (which they do by a Natural Circumvolution which they have, those of *Briony* have a Retrograde Motion about every third Circle in the Form of a double Clasp, so that if they miss one way, they may catch the other). Sometimes the Use of *Claspers* is also for Supply, as in the Trunk Roots of *Ivy*; which being a Plant that mounts very high, and being of a closer and more compact Substance than that of *Vines*, the Sap would not be sufficiently supplied to the upper Sprouts, unless these assisted the Mother Root; but these serve also for Support too. Sometimes they serve for *Stabiliment*, *Propagation*, and *Shade*; for the first of these serve the *Claspers* of Cucumbers; for the second, those, or rather the Trunk Roots of *Chamæmil*; and for all three, the Trunk Roots of *Strawberries*, which mightily seem to delight in Shade.

CLAUDENT Muscles, otherwise called *Semicircular*, are those that shut the Eye-lids; being placed between the *Inner Membrane* of that Part, and the *Fleshy Membrane*. These two Muscles being contracted, shut up the Eye, the greater drawing down the upper Eye-lid, and the less pulling up the lower, which falls down again through its own Gravity, and the Relaxation of its Fibres.

CLAVICULÆ, or *Channel Bones*, are two little ones which are situated at the Basis of the Neck above the Breast, on each Side one: They

are

are pretty long and small, and at one End are joined to the Production of the *Scapule*, called *Acromion*, by a peculiar Articulation, which they call *Synchondrosis*; at the other End they are joined to the upper Part of the *Sternum*, by an Articulation which they call *Arthrodia*. They are in the Shape of a long (J) for the Passage of the Vessels which pass under them; and to facilitate the Motion of the Arms: Their Use is to sustain the *Scapule*, to which the Arms are articulated; and because the Pectoral Muscle which pulls the Arm across the Breast, is inserted near the upper End of the Shoulder-Bone; if the *Clavicule* did not keep the *Scapule* to which the Head of the *Humerus* is always joined at an equal Distance from the *Sternum*, the upper Part of the Arm only, and not the Hand, must have been pulled forwards.

CLAVUS, is a Pain in a small Part of the Head, commonly above the Eye in the Eye-brow, and seems as if that Part of the Head were bored through with a little *Augur* or Whimble. Dr. Sydenham calls such a Pain in the Top of the Head of Hysterical Persons, *Clavus Hystericus*.

CLAUSUM Fregit, signifies as much as an Action of Trespass; and is so called, because in the Writ such a one is summoned to answer, *Quare clausum fregit?* that is, Why he did such a Trespass?

CLAYES or *Wales*, a Term in Fortification: See *Hurdles*.

CLEAR Vision: See *Vision*.

CLEAT, is a Piece of Wood fastened to the Yard-Arm of a Ship, to keep the Ropes from slipping off the Yard.



CLECHE, a Term in Heraldry for any Ordinary being pierced through with the same Figure, as here. He beareth *Gules*, a *Saltier Cleche*, that is, one pierced through with another.

CLEIDION, the same with *Clavicula*.

CLEPSYDRA, an Instrument anciently used, especially among the *Egyptians*, to measure Time, by the running of Water out of one Vessel into another: First invented by *Scipio Mansica*, or at least thought first by him to *Rome*; for *Pierius* in his *Hieroglyphicks* tells us, The Priests of *Acania*, a Town beyond the River *Nile* in *Egypt*, did use every Day to pour Water into a Vessel, by the dropping of which through a small Hole, they measured Time.

There were many kinds of them, but all had this in common, that the Water ran gently thro' a narrow Passage from one Vessel into another; and in the lower was a Piece of Cork or light Wood, which as the Vessel filled, rose up by degrees, and so shewed the Hour.

Plutarch observes one Inconvenience in these *Water-Cocks*, i. e. that the Air, according to its different Temperature, as to Heat, Cold, Density or Rarity, had an Influence on the running of the Water, so that it must measure Time unequally. And another greater there was, which a good while was unheeded, viz. that the Water always ran slower out, according as its Quantity and Pressure in the Vessel abated; to remedy this, the *Orontes* invented a *Clepsydra* in the Form of a small Ship floating on the Water, and which em-

ptied it self by Means of a Syphon, placed in the Middle of it; but which way the Hours by this Means were made equal, I cannot find, the Descriptions given of the thing being very obscure.

Some of these *Clepsydræ* were so made, as that without changing the Dial, the Hours were sometimes longer, and sometimes shorter, by Means of an Inequality in the Index, or Hand, and which *Vitruvius* says, depended on the Management of the Water: for in the long Days they made the Hole narrower, and so the Water ran proportionably slower; and in the Winter, when the Days were short, the Hole was made larger, which made the Water flow the faster, and so the Index turned round also the faster.

CLERICO admittendo, is a Writ directed to the Bishop, for the admitting of a Clerk to a Benefice upon a *ne admittas*, tried and found for the Party that procureth the Writ.

CLERICO capto per Statum Mercatorum, &c. is a Writ directed to the Bishop, for the Delivery of a Clerk out of Prison, that is in Custody upon the Breach of a Statute Merchant.

CLERICO convicto commissio Ecclesie in defectu Ordinarii deliberando, &c. is a Writ for the Delivery of a Clerk to his Ordinary that formerly was convicted of Felony, by reason his Ordinary did not challenge him according to the Privileges of a Clerk.

CLERICO infra Sacros Ordines constitutio non elegendo in Officium, is a Writ directed to the Bishops, &c. that have thrust a Bailiwick or Beadleship upon one in Holy Orders, charging them to release him again.

CLERK Controulor of the King's House (whereof there be two) is an Officer in Court, that hath Place and Seat in the *Counting-house*, and Authority to allow or disallow the Charges or Demands of Pursuivants, and Messengers of the *Green-Cloth*, Purveyors or the like: He hath also the oversight and controuling of all Defaults, Defects and Miscarriages of any of the Inferiour Officers; and sits in the *Counting-House* with the Superiour Officers, viz. the Lord Steward, Treasurer, Controulor and Cofferor, either for correcting or bettering things out of Order, with several other Matters.

CLERK of the Acts, is an Officer of the Navy, who receives and enters the Commissions and Warrants of the Lord-Admiral, and registers the Acts and Orders of the Commissioners of the Navy.

CLERK of Assize, is he that writeth all things judicially done by the Justices of Assize in their Circuits.

CLERK of the Check, is an Officer in Court, so called, because he hath the Check and Controulment of the Yeomen of the Guard, and all other ordinary Yeomen or Ushers belonging either to the King, or Queen, or Prince, either giving leave, or allowing their Absences or Defects, in Attendance, or diminishing their Wages for the same.

CLERK of the Crown, is a Clerk or Officer in the King's Bench, whose Business is to read, frame and record all Indictments against Traitors, Felons and other Offenders there arraigned upon any publick Crime. He is otherwise called *Clerk of the Crown-Office*, or *Clerk of the Crown in the King's Bench*.

CLERK of the Crown in Chancery, is an Officer there, that by himself or his Deputy, is continually

ally to attend the Lord-Chancellor, or Lord-Keeper, for special Matters of State, by Commission or the like, either immediately from his Majesty, or by Order of his Council, as well ordinary as extraordinary: Also all general Pardons upon Grants of them at the King's Coronation, or at a Parliament, the Writs of Parliament, with the Names of Knights and Burgeſſes, are returned into this Office. He hath alſo the making of ſpecial Pardons, and Writs of Execution upon Bonds of *Statute Staple* forfeited.

CLERK of the *Errors*, in the Court of Common-Pleas, does tranſcribe and certify into the King's-Bench, the Tenor of the Records of the Cauſe or Action, upon which the Writ of Error (made by the *Cuſtor*) is brought there to be judged and determined.

CLERK of the *Errors* in the King's-Bench, does likewiſe tranſcribe and certify the Records of ſuch Cauſes in that Court into the *Exchequer*, if the Cauſe or Action were by Bill.

CLERK of the *Errors* in the *Exchequer*, does tranſcribe the Records certified thither out of the King's-Bench, and prepares them for Judgment in the Court of *Exchequer*, to be given by the Juſtice of the Common-Pleas and Barons there.

CLERK of the *Eſſoigns*, is an Officer belonging to the Court of *Common-Pleas*, who only keepeth the *Eſſoign-Roll*, and hath for entering every *Eſſoign* Six-pence, and for every *Exception* to bar the *Eſſoign*, in Caſe where the Party hath omitted his Time, Six-pence. He hath alſo the providing of Parchment, and cutting it into Rolls, and making the Number upon them, and Delivery out of all the Rolls to every Officer, and receiving them again when they be written.

CLERK of the *Eſtreats*, belongs to the *Exchequer*, and every Term receiveth the *Eſtreats* out of the Lord Treſurer's Remembrancer's Office, and writeth them out to be levied for the King: He alſo maketh Schedules of ſuch Sums *eſtreated* as are to be diſcharged.

CLERK of the *Hamper*, or *Hanaper*, or Warden of the *Hamper*, is an Officer in the Chancery, whoſe Buſineſs is to receive all Money due to the King's Majesty for the Seals of Charters, Patents, Commiſſions and Writs; as alſo Fees due to the Officers for Enrolling and Examining the ſame. He is obliged to attend on the Lord Chancellor or the Lord Keeper daily in Term time, and at all times of Sealing.

CLERK of the *Juries*, or *Curata Writs*, is an Officer belonging to the Court of Common-Pleas, which maketh out the Writs called *Habeas Corpora*, and *Diſtringus*, for the Appearance of the Jury either in Court or at Aſſizes, after that the Jury or Pannel is returned upon the *venire facias*.

CLERK of the King's Great Wardrobe, is an Officer of the King's Houſe, that keepeth an Account or Inventory in Writing of all things belonging to the King's Wardrobe.

CLERK of the King's Silver, is an Officer belonging to the Common-Pleas, to whom every Fine is brought, after it has been with the *Cuſtos Brevium*, and by whom the Effect of the Writ of Covenant is entered into a Paper-Book, and according to that Note, all the Fines of that Term are alſo Recorded in the Rolls of the Court.

CLERK of the Market, is an Officer of the King's Houſe, whoſe Duty is to take Charge of the King's Meaſures, and to keep the Standards of

them; that is, Examples of all the Meaſures that ought to be through the Land.

CLERK *Maſhal* of the King's Houſe, ſeems to be an Officer that attends the Maſhal in his Court, and Recordeth all his Proceedings.

CLERK of the *Nibils* or *Nibils*, is an Officer in the *Exchequer*, that maketh a Roll of all ſuch Sums as are nibiled by the Sheriff upon their *Eſtreats of Green Wax*, and delivereth the ſame into the Lord Treſurer's Remembrancer's Office, to have Execution done upon them for the King.

CLERK of the *Outlawries*, is an Officer belonging to the Court of *Common-Pleas*, being a Deputy to the King's Attorney-General, for making out the Writs of *Capias ut legatum* after Outlawry; and the King's Attorney's Name is to every one of thoſe Writs. And whereas Seven-pence is paid for the Seal of every other Writ betwixt Party and Party, there is but a Penny paid for the Seal of this, becauſe it goes out of the King's Suit.

CLERK of the *Parliament*, is he that recordeth all things done in the High Court of Parliament, and engroſſeth them fairly into Parchment Rolls, for their better keeping to Poſterity. Of theſe there be two, one of the Higher, the other of the Lower, or Houſe of Commons.

CLERK of the *Peace*, is an Officer belonging to the *ſeſſions* of the Peace; his Duty is at the *ſeſſions* to read the Indictments, to enroll the Acts, and draw the Proceſs, to enroll Proclamations of Rates for Servant's Wages, to enroll the Diſcharge of Apprentices, to keep the Counterpart of the Indenture of Armour, &c. alſo to certify in the King's-Bench, Tranſcripts of Indictments, Outlawries, Attainders and Convictions had before the Juſtices of the Peace within the time limited by Statute.

CLERK of the *Pell*, belongs to the *Exchequer*, whoſe Buſineſs it is to enter Teller's Bills into a Parchment-Roll, called *Pellis receptorum*, and alſo to make another Roll of Payment, called *Pellis exitum* wherein he ſetteth down by what Warrant the Money was paid.

CLERK of the *Petty Bag*, is an Officer in Chancery, whereof there are three, and the Maſter of the Rolls their Chief: Their Office is to Record the Return of all Inquiſitions out of every Shire, all Liveries granted in the Court of Wards, all *Oſter les marnes*, to make all Patents of Cuſtomers, Gaugers, Controulers and Aulnagers, Summons of the Nobility, Clergy and Burgeſſes to the Parliament; Commiſſions directed to Knights and others of every Shire for ſeiſing of Subſidies; Writs for Nomination of Collectors for the Fifteenth, and all Traverſes upon any Office, Bill, or otherwiſe, and to receive the Money due to the King for the ſame.

CLERK of the *Pipe*, belongs to the *Exchequer*, who having all Accounts and Debts due to the King, delivered and drawn out of the Remembrancer's Office, chargeth them down into the great Roll; who alſo writeth Summons to the Sheriff to levy the ſaid Debts upon the Goods and Chattels of the ſaid Debtors; and if they have no Goods, then doth he draw them down to the Lord Treſurer's Remembrancer, to write *Eſtreats* againſt their Lands.

CLERK of the *Pleas*, is an Officer in the *Exchequer*, in whoſe Office the Officers of the Court upon ſpecial Privileges belonging to them, ought to ſue, or be ſued upon any Action.

CLERK of the Privy-Seal (whereof there be four) that attendeth the *Lord-Keeper of the Privy-Seal*; or if there be none such; upon the Principal Secretary, writing or making out all things that be sent by Warrant from the Signet to the *Privy-Seal*, and are to be pass'd to the *Great-Seal*; as also to make out *Privy-Seals* upon any special occasion of his Majesty's Affairs; as for Loan of Money, and such like.

CLERK of the Sewers, is an Officer belonging to the Commissioners of the *Sewers*, writing all things that they do by vertue of their Commission: See *Sewers*.

CLERK of the Signet, is an Officer continually attending upon his Majesty's Principal Secretary, who always hath Custody of the *Privy-Signet*, as well for Sealing his Majesty's Private Letters, as also such Grants as pass his Majesty's Hand by Bills signed. Of these there be four that attend in their course, and have their Diet at the Secretary's Table.

CLERK of the Treasury, belongs to the *Common-Pleas*, and hath the charge of keeping the Records of *Nisi prius*, hath the Fees due for all Searches, and hath the certifying of all Records into the *King's-Bench*, when a Writ of Error is brought, and maketh out all Writs of *Superfedeas de non molestendo*, which are granted for the Defendants, while the Writ of Error hangeth. Also he maketh all Exemplifications of Records being in the Treasury.

CLERK of the Warrants, is an Officer belonging to the Court of *Common-Pleas*, which entrench all Warrants of Attorney for Plaintiff and Defendant, and enrolieth all Deeds of Indentures of Bargain and Sale, which are acknowledged in Court, or before any Judges out of the Court.

CLEW, of the Sail of a Ship, is the lower Corner of it which reaches down to that Earing, where the *Tackles* and *Sheets* are fastned; so that when a Sail is made goaring, or sloping by degrees, she is said to have a great *Clew*: And a Ship is said to spread a great *Clew*, when she hath a very long Yard, and so hath much Canvase in her Sails.

CLEW-GARNET, is a Rope fastned to the *Clew* of the Sail, and from thence runs in a Block seized to the middle of the *Main* and *Fore-yard*; its Use is to hale up the *Clew* of the Sail close to the middle of the Yard, in order to its being furled.

CLEW-LINE, is the same to the *Top-sails*, *Top-gallant-sails*, and *Sprit-sails*, that the *Clew-garnet* is to the *Main-sail* and *Fore-sail*, and has the very same use. In a gust of Wind, when a *Top-sail* is to be taken in, first hale home the *Lee Clew-Line*, and then the Sail will be taken in the easier.

CLIFF or *Cleff*, a Term in Musick, signifying a certain Mark from the Position whereof the proper Places of all other Notes in any Song or Lesson are understood, by proving the said Notes from thence according to the Scale of the *Ganutt*; wherein are contained three Septenaries of Letters, viz. G, A, B, C, D, E, F; which seven Letters of the Alphabet set at the beginning of every Rule and Space represents as many *Cliffs*; But of these four are only used, and generally placed at the beginning of the Staves of every Lesson, either Vocal or Instrumental.

The First is called *F-a-ut Cliff*, and appropriated only to the *Bass* or lowest Part.

The Second is *C-fol-fa-ut Cliff*, peculiar to the inner Parts, as the *Tenor* and *Counter-Tenor*.

The Third is *G-fol-re-ut Cliff*, which is only set for the *Treble* or highest Part.

The Fourth is *B-Cliff*, or *B-fa-b-mi Cliff*, which is proper to all Parts, and serves for the *Flattening* and *Sharpening* of Notes.

CLIMACTERICAL Years, are certain observable Years; which are supposed to be attended with some grand Mutation of Life or Fortune; as the 7th Year, the 21st, (made up of three times seven) the 49th (made of 7 times 7) the 63d, (being 9 times 7) and the 81st, (which is 9 times 9) which two last are called the *Grand Climactericks*. *Aulus Gellius* saith, This Whim came from the *Chaldeans* first, and 'tis probable *Pythagoras* had it from them, who used to talk much of the Efficacy of the Number 7, with which he was mightily in love.

CLIMATE, is a Space on the Terrestrial Globe comprehended between two Circles parallel to the Equator, so that from the beginning of the *Climare* to that of another next to it, there is half an Hours difference in the longest *Summer-day*. Each *Climare* also is divided into two half *Climates* by a parallel Circle, which half *Climare* is call'd a *Parallel*; wherefore these *Parels* must differ from one another $\frac{1}{2}$ of an Hour in the longest Days.

CLINCH (of a Cable) is that part of it which is bended about the Ring of the Anchor, and then seiz'd or made fast.

CLINCHING, is a kind of slight Calking used at Sea, in a Prospect of foul Weather, about the Ports; which is, to drive a little *Oakum* into their Seams, that the Water may not come in at them.

CLINOIDES, are four Processes in the inside of the *Os Splenoides*, forming a Cavity called *Cella Turfca*, in the middle of that Bone, in which lies the *Glandula Pituitaria*.

CLITORIS, is a Part in the *Pudendum Muliebre* seated before; 'tis a long round Body naturally about the bigness of the *Uvula*: It lies within the Skin, nor doth any part of it appear outwardly, but just its Extremity; which is covered with a folding of the Skin made by the union of the *Nymphæ*, and is called its *Preputium*. The Substance of it consists of two spongy Bodies like those of the *Penis*. They rise at two different places, in the lower Part of the *Os Pubis*, and approaching on to the Body of the *Clitoris*, whose Extremity, which is of an exquisite Sense, is called its *Glans*. The two spongy Bodies before they unite are called by some the *Gruæ Clitoridis*, and they are twice as long as the Body of the *Clitoris*. It hath two Muscles arising from the Protuberance of the *Ischium*, and are inserted in its spongy Bodies; they are called *Erefores Clitoridis*, because they have the same Use as the *Erefores Penis*. The *Clitoris* hath Veins and Arteries from the Hemorrhoidal Vessels and the *Pudenda*, and Nerves from the Intercostal Pair.

CLOATHED, the Seamen say a Mast is cloathed, when the Sail is so long as to reach down to the Gratings of the Hatches, so that no Wind can blow below the Sail; and they say a Ship spreads much Cloth, when she hath broad Sails.

CLOCKS and *Clock-work*: How to calculate all the Numbers and Proportions for any Movement, &c. see under *Watch-work*.

CLOSE, in Musick: See *Cadence*.

CLOSE, when any Bird is drawn in a Coat of Arms with its Wings close down about it (*i. e.* not displayed) and in a standing posture, they Blazon it by this word *Close*; but if it be *Flying* they call it *Volant*.

CLOSETT, a Term in Heraldry, signifying the half of a Barr, and the Barr ought to contain one fifth part of the Escutcheon, as the *Fesse* doth the third: See *Fesse*.

CLOUDS, are a Congeries of (chiefly) watery Particles, drawn or sent out of the Earth, in Vapour; which, when these Particles are very nearly placed to one another, appear dense and thick; but when they are more remote, are clear and bright, and sometimes almost transparent.

It hath been frequently Matter of dispute amongst Naturalists, how these clouds are suspended in a Medium which must be lighter specifically than themselves. But 'tis easy to conceive that the Parts which compose Clouds are so many little Bubbles, having a watery Skin over a little Sphere of fluid Matter lighter than Air, and therefore may easily, like the Bubbles of Soap and Water which the Children blow up with a little Pipe, be supported by the Air: but whenever they are broken by the violent Agitation of Winds, or are driven against the sides of Hills, &c. they must change their form of Bubbles and fall down in Rain: See the word *Vapour*.

Mr. Boyle saith, An excellent Astronomer assured him, That tho' he had many times accurately measured the Height of the Clouds, yet he could never find any (even white ones) to be $\frac{1}{2}$ of a Mile high, and few did exceed $\frac{1}{3}$ of a Mile.

CLOYED; the Seamen say, when any thing is got into the Touch-hole of a Great Gun, so that they cannot with a *Priming-Iron* make way for the Powder to be put in to prime her, they say the Touch-hole is cloyed; wherefore when Guns are nailed, &c. they say they are cloyed.

CLYDON, is a Fluctuation of the Ventricle.

CLYPEAL Cartilage: See *Thyroides*

CLYPEI-FORMIS, a sort of Comets resembling a Shield: See *Discus*.

CLYSMA, the same with *Clyster*.

CLYSSUS, among some Chymists, is a long Digestion and Union of Oily Spirits (especially Mineral ones) together, in order to make a Composition or accurate Mixture of them. Sometimes 'tis taken for an Extraction and Union of the more subtle Parts of any Plant, *Vid. Rosinck, Chym. Lib. 3, Sect. 2. Schroder. Lib. 3, c. 17.* Sometimes for a Medicine made of the most active and energetical Parts of any Ingredients.

COACERVATE Vacuum: See *Vacuum*.

COACH, the Council-Chamber on board a Flag-ship.

COAGULATE, signifies in Chymistry to give Consistence to Liquors by evaporating some part of them over the Fire, or else by mixing Liquors together, which are of different Natures, to effect the same thing; by either of which, and many other ways a Coagulation may be effected.

COALITION, is the gathering together and uniting into sensible Masses the minute Corpuscles which compose any Concrete or Natural Body. *Calescence* is commonly taken for the same.

COAMINGS, aboard a Ship, are those Planks or that Frame which raises up the *Hatches* higher than the rest of the Deck, in which Loop-holes for *Muskets* to shoot out at are usually made, in order

to clear the Deck of the Enemy when a Ship is Boarded.

COASTING, is that Part of Navigation where the Places assign'd are not far distant, so that a Ship may Sail in sight of Land, or within Soundings between them.

For the Performance of which there is only required good Knowledge of the Land, the Use of the Compass, and Lead or *Sounding-Line*; such are the Voyages on the Narrow or *British Seas*, between *England, Holland and France*, also all about the *Baltick Seas*, and those in the *Mediterranean* are little else.

COAT, by Anatomists, is taken for a Membranous Cover of any part of the Body; as the Coats of the Eye, Nerves, Arteries, &c.

COATS, in a Ship, are pieces of tarr'd Canvas which are put about the Masts at the Partners; they are also put about the Pumps at the Decks, that no Water may go down there; and these are also used at the Rudders's Head.

COCYGIS OS, is a Cartilaginous kind of Bone joined to the Extremity of the *Os Sacrum*; it is composed of 3 or 4 Bones, of which the lower is still less than the upper, till the last end in a small Cartilage, and it resembles a little Tail turn'd inwards: Its Use is to sustain the *Rectum Intestinum*; it yields to the pressure of the *Fetus* in Women in Travail, and therefore Midwives use to thrust it backwards; but sometimes they do it so rudely and violently, that it occasions very great Pain, several bad Effects. It's called *Os Coccygis*, and because it is in shape something like a *Cuckow's Bill*; its Bones are spongy and soft, and have neither Process nor Cavity, for the Spinal Marrow descends no farther than the bottom of the *Os Sacrum*, which terminates in the first Bone of the *Os Coccygis*.

COCYX, the same with the *Coccygis Os*: Which see.

COCHLEA, is a Cavity of the inner part of the Ear, so called from its Windings and Turnings, for it has 3 or 4 Rings which mutually succeed one another; it is girt about with a very soft and thin Membrane: See *Ear*.

COCKPIT, in a Man of War, is a place on the lower Floor or Deck abaft the main Capstan, lying between the Platform or Orlop and the Steward's Room, where are Subdivisions or Partitions for the Purser, the Surgeon, and his Mates.

COCK-SWAIN or *Cock/on*, is an Officer aboard a Man of War who hath the care of the Barge or Shallop, and all things belonging to it, to be always ready with his Boat's Gang or Crew, and to Man the Boat on all occasions: He sits in the Stern of the Boat and Steers; and he hath a Whistle to call and to encourage his Men.

CONCOCTION or *Digestion*, is the Fermentation of the smallest Particles which our Nourishment consists of, that they may be made fit and proper for the Nourishment and Increase of a living Body; the first Concoction is made in the Stomach by a kind of Ferment, as most suppose, which partly remains there, from the Relicks of the former Meats, and partly flows thither from the *Celiac Arteries*: The second is made in the Guts by the Gall and *Pancreatic Juice*; the third is in the Glandules of the *Mesentery* from the *Lymphæ* or Water which mixes it self with the *Chyle*: the fourth is in the Lungs, from the mixing the Air in some measure with the Blood there: The fifth is in the Vessels and Bowels, as in the Spleen, Liver, Testicles, &c.

The Roman Silver Denarius was $7\frac{1}{2}$ d.
 The Roman Gold Denarius's were double in weight.
 The Roman Brazen As weighed $\frac{1}{2}$ Ounce; valued
 $\frac{3}{4}$ Farth. $\frac{1}{10}$.
 The Assarium was $\frac{1}{5}$ of the As.
 Quadrans $\frac{1}{4}$ part.
 The Mirre was $\frac{1}{3}$ of the As, or about $\frac{2}{5}$ of our Far-
 thing.

Sestertius (mark'd thus IIS) was 2 Asses, and $\frac{1}{2}$ of
 the As, in Value 7 Farthings and $\frac{1}{10}$ of a Far-
 thing.
 Denarius (mark'd thus, X) was 10 times the As,
 and therefore was of our Money 7 Pence 3 Far-
 things.
 Sestertium was 8 l. 1 s. 5 d. 2 f.

An Account of the Hebrew Coins from Mr. Jeak's Arithmetick.

		l. s. d.								
Money	Silver	(a) Shekel, of the Sanctuary, in { Weight $\frac{1}{2}$ Oz. Troy Value to Sterling Money }	00	02	06					
		(b) King's Shekel, half the Sanctuary Shekel, called Bekah	00	01	03					
		(c) Third Part of the Shekel	00	00	10					
		(d) Zuz, Fourth Part of the Shekel	00	00	07 $\frac{1}{2}$					
		(e) Gerah, Agurab, Keshitab	00	00	01 $\frac{1}{2}$					
	Gold	(f) Zabab Golden Siculus or Shekel	each $\frac{1}{2}$ Oz. Troy, in Value 12 Silver Shekels of the Sanctuary }	01	10	00				
		(g) Adarkon Dracmon, or Darcon					each half so much	00	15	00
		Sums of Money	(b) Maneh, or Mina, or a Pound, valuable in {	Gold 100 Shekels 25 Oz. Troy Silver 60 Shekels 30 Oz. Troy }	75	00	00			
								(i) Chicbar or Talent { 3000 Shekels in Weight 123 lb. Troy }	valuable in { Gold 4500 Silver 375 }	00

(a) This piece of Coin is often mentioned in Sacred Writ, and looks like the Standard of all the rest. On the one Side was shew'd the Vessel in which the Manna was, inscribed in this Perigraph Shekel Israel; on the other Side the Rod of Aaron that budded, with this Inscription, Jerusalem Kod-shaf, in English, The Holy Jerusalem, called Shekel from Shakal to weigh: For Money, at the first, seems to be a Merchandise, exchanged or given for other Commodities, as Gen. 23. 16. after the Chaldees called Silgha, and commonly with the Hebrews, Kesheph, i.e. Silver; and being put absolutely, rendered a Silverling or Piece of Silver, by Expofitors, as usually as a Shekel, when the Quality is not mentioned, is taken for a Silver Shekel.

(b) First mentioned, Gen. 24. 22. paid by all as a Yearly Tribute, Exodus 30. 13, 15. 2 Chron. 24. 6, 9. towards the Repair of the Tabernacle first, and after of the Temple. Between this and the Sanctuary Shekel some mentioned a third sort of Shekel, called the Common Shekel, valued at 20 d. of our Money, of which I find nothing but uncertainty.

(c) In Nehem. 10. 32. noted as a Yearly Tribute given to the Jews by a Civil Decree to the Second Temple.

(d) 1 Sam. 9. 8. spoken of and equal to the old Attick Dram and Roman Penny, as several say, and by some called Zuz, Zuzza, Zur and Zuzra.

(e) Agurab, render'd Gerah by the Chaldee Paraphrase, and also Megna or Megha in that Tongue; by the Arabians, Mega; Greeks, Obolus; and in English, a Piece of Silver, 1 Sam. 2. 36. called also in the Hebrew, Keshitab, because Signed with the Image of a Lamb; see Gen. 33. 19. Jobna 24. 32. Twenty of these made a Shekel, Exod. 30. 13.

(f) The Zabab, and Golden Shekel in Rider's Dictionary undervalued at 15 s. for tho' Hunt in his Handmaid to Arithmetick out of Breerwood de Nummis, mentioneth the Weight but two Attick Drams, yet he valueth it at 30 Shill. Alsted in his Encyclo-

pædia of Arithmetick makes it 4 Drams, which accounted $\frac{1}{2}$ Ounce Troy, must yield double the Value of 15 Shill. And most Authors agree that the Gold Shekel was equal in Weight with the Silver Shekel, so the Difference must be only in the Value of the Metal. Some to keep up the Credit of differing Authors, conceive there were two sorts of Golden Shekels as well as Silver, the one double to the other.

(g) These Golden Adarkons and Drackmons seem to be Persian, or Coins of some other Nations, and Current, not Coined in Judea, nor read of till after the Captivity; for tho' the Word be used 1 Chron. 29. 7. yet both Books of the Chronicles, as most take it, were penn'd by Ezra after his return from Babylon, in whose Book mention is made thereof, as in Ezra 2. 69. and 8. 27, etc. in Greek called Drachme, and in English render'd Drams. Alsted, in his Encyclopædia of Arithmetick, makes the Value equal to a Ducat of Hungary: But Hunt, who throughout his Book hath much lost himself in valuing 2 Attick Drams in the Zabab at 30 sb. and 2 Attick Drams in the Adarkon (which he saith is the Weight thereof) at 15 s.

(b) The Maneh in Gold, by comparing 1 King. 10. 17. with 2 Chron. 9. 16. is found to be 100 Shekels, which Buxtorf and others understand not of the Holy but the Royal Shekel. The Maneh in Ezek. 45. 12. seems to be 60 Shekels, and hereto several agree, but some think it was now encreased 19 Shekels more than of old, and call it the new Maneh, valued nevertheless with most after the Holy Shekel, in Silver at 7 l. 10 s. Buxtorf tells us also of a Maneh of 25 Holy Shekels. The Assembly's Annotations on Ezek. 45. 12. make 3 sorts of Manehs, viz. Common 15, the King's 20, and the Holy 25 Shekels; but the Word Maneh is Singular and not Plural in the Hebrew Text there, as noting all those Divisions to make but one Maneh.

(i) The *Chibar*, by some wrote *Kiebar*, and commonly translated *Talent*, contained 3000 *Shekels*, as may be collected from *Exodus* 38. 25, 26. where the Silver collected is expressed to be 100 *Talents*, and 1775 *Shekels*, v.g. and the Persons that paid it at half a *Shekel* a Piece, v. 26. numbered to be 603550, whereof the Half is 301775, which divided by 3000, the *Shekels* in one *Talent*, makes 100 *Talents*, and leaves the odd *Shekels* remaining 30) 1775 (100

3 000

The *Talent* thus valued after the *Holy Shekels*, makes the number of *Talents* mentioned in some Texts of Scripture, especially 1 *Chron.* 22. and 29 *Chapters*, amount to such Maffy Sums, that some think the *Talents* are to be reckoned at the Rate of the other *Shekel*; and others, not improbably, that the *Jews* had a Piece of Money or Plate of Gold of small Value (as may be observed anciently in *Homer Iliad lib.* 23.) called a *Talent*. And *Fuller* in his *Pisgab sight of Palestine*, Book 3. P. 356, 357. shews whereon such an Opinion may be strengthened; and that the *Talent* mentioned in some Scriptures may be rather this than the other.

The Account both of the Hebrew Weight and Money, with their Value in Sterling-Money and Troy-Weight, is Contrasted into the following Table.

Hebrew Gold and Weights.

Chibar or Talent	I	Month.
Maneh or Pound	Old New	I
	60 50	New Old Zabab.
Zabab or Shekel	3000	60 50 I Adark.
Adarkon or Dram	6000	120 100 2 I
Troy-Weight	125 l.	2 1/2 1 1/3 1/2 Oz. 1/2 Oz.
Sterling-Money	4500	90 l. 75 l. 11 l. 10 s. 15 s.

Hebrew Silver and Weights.

Chibar or Talent.	I	Month
Maneh or Pound.	Old New	I
Shekel	3000	60 50
Bekah	6000	120 100
Third Part.	9000	180 150
Fourth Part, Zuzim or Drams.	12000	240 200
Gerahs.	60000	1200 1000
Troy-Weight.	125 l.	2 1/2 1 1/3 1/2 Oz. 1/2 Oz.
Sterling-Money.	375 l.	7 l. 10 s. 6 s. 2 d. 6 l. 1 s. 3 d. 7 1/2 d. 7 1/2 d. 1 1/2 d.

The Roman *Libra*, called also *As*, and by Translators commonly rendered a *Pound*, was divided into 12 *Ounces*, and for every Number of *Ounces* under 12, a proper Name used; as,

Denex	11
Dexians and Decunx	10
Drodans	9
** Bes, Bessis, and of Old Des	8
Septunx	7
Semis, Semissis, Semissus, Sella, and Simbella	6
Quincunx	5
Triens	4
Quadrams, and Triunx	3
Sextans	2
Uncia	1

Malines, P. 24. of his *Lex Mercatoria*, divides *Pounds*, which he calls the Old *Pound* of the Romans, into

64	Dinariis.
128	Quinariis.
256	Septertis.
640	Asses.
1280	Semilibella's.
2560	Teruncios.

A Reason is wanting why *Legat* makes the Roman *Libra* of 12 Oz. but 10 1/2 Oz. Troy, since if he reckon by the Number of Grains (the Original of Weights) at 5760 Grains of Assize in the *Pound* Troy; it can be but 10 Oz. just; for 10 times 6912, the Grains in a Roman *Pound*, and 12 times 5760 are equal: But if he count the *Pound* Troy at 7580 Grains, according to the Statute at 32 Grains of Wheat to a Penny-Weight, the *Troy Pound* will be 13 1/2 Oz. Roman.

** Bes

** *Beis*, is the Mark Weight, two Thirds of the Pound, *Malines*, P. 24. aforesaid, makes the *Beis* or Old Mark of the Romans to be divided into

- 16 Loos, or Tetradrans.
- 23 $\frac{1}{2}$ Tridrans.
- 32 Didrans.
- 64 Drans.
- 96 Obolos, or Treobolus.
- 128 Triobulos.
- 384 Obolos.
- 768 Miobolos.
- 3840 Moments.

b. *Semiuncia*, or the Half Ounce, is sometimes called *Assarion* and *Assarius*; and by *Alsted*, *Lotho*, answering to a German Weight of that Name.

c. *Duella*, being double the Weight of the *Sextula*, is sometimes called *Bina Sextule*.

d. *Sicilicum*, or *Silicus*, and by Abreviation *Siclus*, is $\frac{1}{4}$ of an Ounce.

e. *Sextula*, used promiscuously with *Sextans* and understood, by import of the Name, to be the Sixth Part.

f. *Denarius*, a Penny Weight, the seventh Part of the Ounce, whether used to Weigh any thing

but Money as the other Divisions thereof, somewhat questionable, see among the Money, *Alsted* compares the *Drachmal Denarius* to the German Weight *Quintlein*.

g. *Quinar*, was half the Penny Weight, and a Piece of Money set afterward among the Roman Coins.

*, Between the *Quinar* and *Scruple* some mention a Weight called *Termiffis*, containing 32 Grains, being the 18th Part of an Ounce.

h. *Quadrane*, here, is $\frac{1}{4}$ of the Penny Weight; and so called *Quadrans Denarii*, to distinguish it from *Quadrans Librae*, which was 3 Ounces.

i. *Sextans*, called *Sextans Denarii* to difference it from *Sextans Librae*, was the sixth Part of the Penny-Weight, and sometimes called *Sextula*.

k. *Obolus*, or half a *Scruple*, called sometimes *Simplium*, weigheth 12 Grains. If there be another *Obolus*, as some say, which was the Third Part of a *Quinar*, it seems to be a Piece of Coin, and must weigh 12 $\frac{1}{2}$ Grains, and so is all one with the *Sextans*, according to the *Tabulary Divisions*; yet this sort of *Obolus* they make to contain but 10 Grains.

Between the *Obolus* and the *Siliqua* some mention a *Cerates*, which they say contains 6 Grains, and so is $\frac{1}{2}$ the *Obolus*, or $\frac{1}{4}$ of the *Scruple*.

Roman Monies, and their English Values.

			l.	s.	d.						
Roman	Money before the Translation of the Imperial Seat to Bizantium.	Brass	Less than the As.	Sextula, $\frac{1}{12}$ Unicae	00	00	00 $\frac{1}{2}$				
				Semiuncia, $\frac{1}{24}$ Unicae	00	00	00 $\frac{1}{4}$				
				Unica, $\frac{1}{12}$ Affis.	00	00	00 $\frac{1}{2}$				
				Sextans, $\frac{1}{24}$ Affis	00	00	00 $\frac{1}{4}$				
				Quadrans	} $\frac{1}{4}$ Affis		00	00	00 $\frac{1}{4}$		
				Triunx							
				Teruntius							
				Triens, $\frac{1}{8}$ Affis	00	00	00 $\frac{1}{2}$				
				Semissis, $\frac{1}{4}$ Affis	00	00	00 $\frac{1}{2}$				
				As or Libra	} $\frac{1}{2}$ Denarii		00	00	00 $\frac{1}{2}$		
		Decussis, 10 Affes									
		Vicessis, 20									
		Tricessis, 30									
		Quadracessis, 40									
		Quinquacessis, 50									
		Sexacessis, 60									
		Septuacessis, 70									
		Octacessis, 80									
		Nonacessis, 90									
		Centussis, 100	00	00	03						
	Silver	or	Nummi	Teruntius, $\frac{1}{12}$ Denarii	00	00	00 $\frac{1}{4}$				
				Sembella, $\frac{1}{24}$ Libellae	00	00	00 $\frac{1}{2}$				
				Libella, $\frac{1}{12}$ Denarii	00	00	00 $\frac{1}{2}$				
				Obolus, $\frac{1}{24}$ Denarii	00	00	01 $\frac{1}{2}$				
				Sestertius, $\frac{1}{24}$ Affes	00	00	01 $\frac{1}{2}$				
				Victoriatius	} $\frac{1}{2}$ Denarii		00	00	03 $\frac{1}{2}$		
				Quinarius							
				Nummuli	Bigatus	00	00	07 $\frac{1}{2}$			
				Gold		Denarius	} New, 10 Affes, $\frac{1}{2}$ Oz.		00	00	07 $\frac{1}{2}$
						Old, $\frac{1}{2}$ Oz.					
						Tremissis, or Golden Triens	00	05	00		
						Semissis, or Golden Drachmal	00	07	06		
						Imperatorius	00	15	00		
Ament, or Consularis	00	15	00								
Follis	00	00	00 $\frac{1}{2}$								
Money after the Translation of the Imperial Seat to Bizantium.	Brass										
	Silver		Siliqua, or	} Ceratium Simple							
			Ceratium Magnum								
	Milliarasium	00	01	03 $\frac{1}{2}$							
	Constantine's Piece	00	08	06 $\frac{1}{2}$							
	Valentinian's Piece	00	10	00							
	Gold		Semissis, or Half Piece	00	05	00					
			Triens, or $\frac{1}{3}$ of that Piece	00	03	04					
			Scruple, or $\frac{1}{4}$ of that Piece	00	02	06					
Quadrantes, Sestertios.											
Roman Sums of Money		Sportula, containing 100, or 10	00	01	06 $\frac{1}{4}$						
		Libra, a Pound of 96 Drams	03	00	00						
		Sestertium (in the Neuter Gender) containing	} 07	16	03						
		1000 Sestertio's (in the Masculine Gender)									
Talent, containing 24 Sestertio's, or 6000 Denario's	178	10	00								

The Brass Unica, misprinted in Rider, at $\frac{1}{12}$ Affis; for $\frac{1}{12}$ Part of three Farthings, cannot be $\frac{1}{12}$ of our Penny, counting 4 Cees to a Farthing as they do.

So also is As, as ob. q. for ob. qa. for As being the 10th Part of the Denarius, must be 3 Farthings, 10 times 3 making 30 Farthings, which is $7 \frac{1}{2}$ d. the Value of the Denarius. To the Brass As was the Silver Libella equal in Value.

Obolus, being $\frac{1}{24}$ of the Roman Penny, is called by Celsus, Sextans.

Sestertius, English'd a Sestertian, was $\frac{1}{4}$ of the Roman Penny, and being of the Masculine Gender, was differenced from the other being of the Neuter Gender, and in Numbring by these Sestertians, these 3 Rules are to be observed.

1. If the Numeral Noun agree in Case, Gender and Number with the Sestertian, it signifieth barely just so much as was pronounced, as Decem Sestertii is 10 Sestertians.

2. If the Numeral Noun of another Case be

joined with the Genitive Case Plural of Sestertius, it noteth so many Thousands, as Decem Sestertium (for Sestertiorum) is Ten Thousand Sestertians.

3. If an Adverb be put without any Numeral joined, as Decies, Viginti, &c. or joyned with Sestertium the Genitive Case Plural, there is understood by it so many Hundred Thousand, as Decies Sestertium is Ten Hundred Thousand Sestertians, Alitè delivers it thus;

From 1 Sestertian to 1000 in the Masculine Gender, as Unus Sestertius, Decem Sestertii, &c. is 1 Sestertian, 10 Sestertians, &c.

From 1000 to 100000 in the Neuter Gender and Plural Number, as Singula Sestertia 1000 Sestertians, Bina Sestertia, 20 Sestertians, &c.

From 100000 upward, all expressed adverbially and in the Genitive Plural, as Semel Sestertium 100000, Decies Sestertium 1000000, &c.

Victorinus was so called, because stamped with the Image of *Victory*; and *Quinarus*, because equal in Value to 5 Brass *Asses*, or half the *Denarius*.

Bigatus, some call *Quadratus*, had the Print of a Cart or Chariot on it, and was of Value equal with *Denarius*.

Denarius, q. d. *Dena æris*, because it containeth 10 *Asses*, rendred a Penny. Mar. 18. 28. and 22. 19. at the Old Rate was $\frac{1}{2}$ of an Ounce, and at the new $\frac{1}{4}$, and at this Rate all the other Coins are valued in the Table. This is sometimes called the *Drachmal Denary* for Distinction sake. Some make 3 sorts of Pence, the heavier weigheth $1\frac{1}{2}$ *Attick Dram*, the Mean of one *Dram*, and the least lighter than 1 *Dram* by $\frac{1}{2}$ of an Ounce, or thereabouts. Some say one was $\frac{1}{8}$ of the *Roman Unica*, the Mean $\frac{1}{4}$, and the Lighter $\frac{1}{8}$. *Budeus* makes the *Attick Dram* and *Roman Penny* of the same Weight and Worth, wherewith most agree, and accordingly each in the foregoing Tables are valued at $7\frac{1}{2}$ d. after 5 Shillings the Ounce.

The Golden *Denarius* mentioned in *Holyoke* at 2 s. $4\frac{1}{2}$ d. *Sterling*, I have omitted, as not satisfied in the Weight, nor certain of such a Coin.

The Golden *Amient* seems the Eldest and Great-

est, a Piece Coined by the *Consuls*, therefore called *Consularis*, weighed $2\frac{1}{2}$ Drams.

The *Imperatorius*, or Piece of the Emperor's Coin 2 Drams.

The *Drachmal* 1 Dram, and the *Triens* of the *Imperatorius*.

After *Constantine* removed his Seat to *Bizantium*, now called *Constantinople*, a City after his own Name, we read of *Follis* in *Eusebius*, a Brass Piece, as *Lampridius*, or of Iron, as *Eustatius* saith, so called because it representeth a Leaf, in Latin *Folium*, and was $\frac{1}{2}$ of the Silver simple *Siliqua*.

The Silver *Siliqua* or *Ceratum* was double: The Simple $\frac{1}{2}$ of the *Millierifum*, value 5 d. The Great called *Cerates*, 1 *Dram* equal to the Penny $7\frac{1}{2}$ d.

Milliarifum, weighed 2 Drams.

Constantine's Piece of Gold was called *Romanus Solidus*, at the Proportion of 7 s. 5 d. for a *Dram* of Gold must weigh $1\frac{1}{2}$ Dram.

These continued current till *Valentinian*, who made his Coin somewhat heavier.

Valentinian's Piece of Gold by some is called *Sextula*. and being valued at 10 s. *Sterling*, must weigh $1\frac{1}{2}$ Dram.

Of which the { *Semissis*
{ *Tremissis*, or *Triens* } being { $\frac{1}{2}$ } was { $\frac{1}{4}$ } of a *Dram*.
{ *Scruple*.

Sportula, say some, was a Lawyer's Fee, or an Alms distributed by Princes among the People. See *Selden's History of Tythes*, Chap. 4. P 37, 38.

Accounts of Exchange of Money at several Places.

2. 11. *Aleppo*, the Exchange is made by *Sultanes* of 120 *Aspers*, or *Dollars* of 80 *Aspers*, every *Asper* 10 *Marcherines*.

3. 1. *Alexandria*, they account by *Ducats*, either *Ducat* de *Pargo*, of 120 *Mails*, *Ducat* of *Venice* of 40 *Mails*, or *Italian Ducat* of 35 *Mails*.

1. 7. *Ancona*, Exchange is made on the *Ducat* of 21 *Gros* (which is in *Specie* 23 *Gros*) which *Ducat* also is 14 *Carlina*, and every *Carlina* 6 *Bollidini*; so in the *Ducat* of 84 *Bollidini*.

1. 4. *Aragon*, the *Rial* or *Ryal* of the Plate is 23 *Dinero's* (*Hunt* saith 13) and the *Ducat* is 12 *Ryals*, whereon they make Exchange; and they account by *Pounds* of 20 s. and 12 d. And the *Ducat* of 12 *Ryals*, every *Ryal* of 1 s. or 12 d.

1. 8. *Artois*, and in several other Places they Account and Exchange by *Pounds* or *Livres*, *Tournois* of 20 *Stivers*, or 40 Pence *Flemish*, whereof 6 called *Guilders* or *Florins* makes the *Pound Flemish* in all the 17 Provinces of the Netherlands; which *Pound* is divided into 20 s. and every *Shilling* into 12 d. &c.

Some reckon by the *Pound Paris*, which is but 20 Pence, whereof 12 make 1 *Pound Flemish*,

but their Accounts, as also the Finances of the Princes, are kept by *Pounds Tournois*, and both *Pounds* divided in 20 s. and every *Shilling* into 12 Pence, admitting also the Subdivisions of *Obolo's*, *Maille*, *Heller*, *Hallnick*, *Corte*, *Mites*, *Points*, *Engevin*, *Poot*, and such like *Copper Monies*.

Alsted mentions the *Florin* in *Germany* to be 15 *Batz*, every *Batz* 2 *Albes*, every *Albe* 8 *Oboli* or *Nummos*: so shall the *Florin* be 30 *Albes* or 240 *Oboli*.

1. 4. *Augusta* or *Ausburgh*, Accounts on the *Dollar* Coined at 65 *Creutzers*, risen since to 72. Exchange is made on the imaginary Rate of 65 *Creutzers*.

A *Creutzer* is sometimes called a *Schreikenborger*, and in Latin *Crucigerus* and *Cruciatas*, being Pieces stamped with a Cross: Their *Gros* make 12 *Creutzers*; their *Lyon Piece* half a *Creutzer*. They have their *Snubourgh*, *Blaphart* or *Bohemico's* of 3 and $\frac{1}{2}$ *Creutzers*. The *Rix* or *Rycks Doler* is 30 *Albes* of 8 d. every *Albe*, or 72 *Creutzers* every *Dollar* as before. See the following Table, and afterwards in *Germany*.

Dollar	Gros.	Batz.	Albes.	Creutzers.	Lyon.	Pence.	Black-pennies.
	6	18	30	72	144	240	288
		3	5	17	24	40	48
		Batz.	12	4	8	13 $\frac{1}{2}$	16
			Albes.	2 $\frac{1}{2}$	4 $\frac{1}{2}$	8	9 $\frac{1}{2}$
				Creutzers.	2	3 $\frac{1}{2}$	4
					Lyon.	1 $\frac{1}{2}$	2
						Penny.	1 $\frac{1}{2}$

3. 2. *Barbary*, generally Accounts are kept, and Commodities sold by Ducats of 10 Oz. each Ounce divided into 8 Parts, which 8 Part is in Value 12 d. Sterling.

1. 14. *Barcelona*, as at *Aragon*.

1. 4. *Bavaria*, Accounts and Exchanges both are by Guilders of 7 s. and 30 d. to the Shilling.

1. 4. *Bohemia*, as in *Germany*, generally by the Dollar of 24 *Behemico's*, called also *White Grofs*, each of 3 *Creutzers*: Other Divisions see in the Table following.

Soc.	Mark's Dollars.		Angl's. Bohemico's.		Creutzers.		Pence.
	1 1/2	2 1/2	30	60	180	600	
Mark.	1 1/2	2 1/2	20	40	120	400	
Dollar.	1 1/2	2 1/2	12	24	72	240	
Angl's.			12	24	6	20	
Bohemico.			2	6	3	10	
Creutzer.					3	10	

1. 7. *Bologna*, they account by *Piastra* or *Pounds* (called also *Piaftri*) each containing 20 *Bolognese*; and exchange on the Ducat of 4 *Piaftri*.

1. 8. *Brabant*, and in most Places of the *Low Countries* Monies are accounted by the *Pound Flemish*, containing 20 s. *Flemish*, and every Shillings 12 d. or *Deniers*, called single *Stivers*, two of which make one double *Stiver*. See *Flanders*.

1. 4. *Breslaw*, they reckon by Marks of 32 Grofs of 12 *Hellers* to the Grofs; and exchange by 30 *Florins*, to have at *Norrenburgh* 32 *Florins*, and at *Vienna* 34 *Florins*.

1. 7. *Calabria*, Exchanges are made by the *Naples* Ducat of 10 *Carlini*.

1. 14. *Castile*, Exchanges are made on the Ducat of 375 *Marvedies*, which they call in the Bill of Exchange *Ducados d'oro*, or *de Peso*: to be paid out of the Bank is better by 6 or 8 *pro Militar*. See *Spain*.

1. 14. *Catalonia*, as at *Aragon*.

1. 4. { *Cleves*, } both Accounts and Exchanges
1. 4. { *Collen*, } are made by Dollars of 72 *Creutzers*.

Their Guilders is	Marks, Morkens. White Pennies		Shillings, or Stivers.	
	4	12	24	48
Mark.	3		6	12
Morken.		2		4
White Penny.				2

1. 5. *Constantinople*, as *Aleppo*.

1. 9. *Danzick*, they account by *Polish* Guilders of 30 Grofs, every Grofs 18 d. They buy with the great Mark of 60 Grofs, or the little Mark of 15 Grofs; also by the *Scoc*. of 3 great Marks: And exchange upon the *Florin Polish*, or the *Pound Flemish*. They have Dollars of 35

Grofs of 3 Shillings, and new Dollars of 24, 26 or 30 Grofs. Their *Gilden* is 80 Grofs, 60 is

Soc.	Great Dollars.		Little Grofs.		Pence.
	3	5 1/2	6	12	180
Gilden.	1 1/2	2 1/2	2 1/2	5 1/2	80
Great Mark.	1 1/2	2 1/2	2 1/2	5 1/2	80
Dollar.	1 1/2	2 1/2	2 1/2	5 1/2	80
Guilder.	1 1/2	2 1/2	2 1/2	5 1/2	80
Little Mark.	1 1/2	2 1/2	2 1/2	5 1/2	80
Grofs.	1 1/2	2 1/2	2 1/2	5 1/2	80

1. 1. *Denmark*, they account by Marks of 20 Shillings, and exchange upon the Dollar.

1. 6. *Dublin* See *Ireland*.

1. 12. *Edinburgh*: See *Scotland*.

1. 4. *Emden*, they reckon by *Gilders*, and exchange on the *Rix-Dollar*, but from *London* hither and thither, upon the *Pound Sterling*.

1. 8. *Flanders*, as before in *Brabant*. See a more particular Division of the *Flemish* Money in the following Table.

Flemish Pound.	Double Single		Gros's, Origen's.		Negon- Copper Mites.	
	Guilder.	Shilling.	Guilder.	Shilling.	Guilder.	Shilling.
0	20	60	120	240	480	960
1	20	60	120	240	480	960
2	20	60	120	240	480	960
3	20	60	120	240	480	960
4	20	60	120	240	480	960
5	20	60	120	240	480	960
6	20	60	120	240	480	960
7	20	60	120	240	480	960
8	20	60	120	240	480	960
9	20	60	120	240	480	960
10	20	60	120	240	480	960
11	20	60	120	240	480	960
12	20	60	120	240	480	960
13	20	60	120	240	480	960
14	20	60	120	240	480	960
15	20	60	120	240	480	960
16	20	60	120	240	480	960
17	20	60	120	240	480	960
18	20	60	120	240	480	960
19	20	60	120	240	480	960
20	20	60	120	240	480	960
21	20	60	120	240	480	960
22	20	60	120	240	480	960
23	20	60	120	240	480	960
24	20	60	120	240	480	960
25	20	60	120	240	480	960
26	20	60	120	240	480	960
27	20	60	120	240	480	960
28	20	60	120	240	480	960
29	20	60	120	240	480	960
30	20	60	120	240	480	960
31	20	60	120	240	480	960
32	20	60	120	240	480	960
33	20	60	120	240	480	960
34	20	60	120	240	480	960
35	20	60	120	240	480	960
36	20	60	120	240	480	960
37	20	60	120	240	480	960
38	20	60	120	240	480	960
39	20	60	120	240	480	960
40	20	60	120	240	480	960
41	20	60	120	240	480	960
42	20	60	120	240	480	960
43	20	60	120	240	480	960
44	20	60	120	240	480	960
45	20	60	120	240	480	960
46	20	60	120	240	480	960
47	20	60	120	240	480	960
48	20	60	120	240	480	960
49	20	60	120	240	480	960
50	20	60	120	240	480	960
51	20	60	120	240	480	960
52	20	60	120	240	480	960
53	20	60	120	240	480	960
54	20	60	120	240	480	960
55	20	60	120	240	480	960
56	20	60	120	240	480	960
57	20	60	120	240	480	960
58	20	60	120	240	480	960
59	20	60	120	240	480	960
60	20	60	120	240	480	960
61	20	60	120	240	480	960
62	20	60	120	240	480	960
63	20	60	120	240	480	960
64	20	60	120	240	480	960
65	20	60	120	240	480	960
66	20	60	120	240	480	960
67	20	60	120	240	480	960
68	20	60	120	240	480	960
69	20	60	120	240	480	960
70	20	60	120	240	480	960
71	20	60	120	240	480	960
72	20	60	120	240	480	960
73	20	60	120	240	480	960
74	20	60	120	240	480	960
75	20	60	120	240	480	960
76	20	60	120	240	480	960
77	20	60	120	240	480	960
78	20	60	120	240	480	960
79	20	60	120	240	480	960
80	20	60	120	240	480	960
81	20	60	120	240	480	960
82	20	60	120	240	480	960
83	20	60	120	240	480	960
84	20	60	120	240	480	960
85	20	60	120	240	480	960
86	20	60	120	240	480	960
87	20	60	120	240	480	960
88	20	60	120	240	480	960
89	20	60	120	240	480	960
90	20	60	120	240	480	960
91	20	60	120	240	480	960
92	20	60	120	240	480	960
93	20	60	120	240	480	960
94	20	60	120	240	480	960
95	20	60	120	240	480	960
96	20	60	120	240	480	960
97	20	60	120	240	480	960
98	20	60	120	240	480	960
99	20	60	120	240	480	960
100	20	60	120	240	480	960

Five single *Stivers* are current in several Places of the *Low Countries* for six Pence Sterling; Or-

kens in some Places are called Duyts; Mites in some Places of *Flanders* are called Cortes, Engcuni, Points, Pites, Poots.

1. 7. *Florence*, they account by Crowns of 20 s. 12 d. to the Shilling; and exchange by a Ducat called *Lugo*, or *scripto in Banco*. A Florin there is 24 Quatrini.

1. 3. *France* generally they use Livres, Sols, and Deniers, and commonly account by them, as the *English* by Pounds, Shillings and Pence; but by an Edict made 1577, their Accounts are to be kept in French Crowns of 60 Sols to the Crown, or 3 Livres, that is, Pounds *Tournois*; and Exchange is made thereupon, unless for some Places in *Italy*, where they exchange for number, to have so many Ducats for so many Crowns of the Sum, not in *specie*, but imaginary, yet repeating the Value or Par. See further in the Table and Notes thereupon.

	Livres.	Sols.	Liarts.	Doubles.	Deniers.
French Crown	3	60	240	360	720
A	Livre.	20	8	120	240
B	Sols.		4	6	12
C	Liart.			1½	3
D	Double.				2
E					

There are also Petit Deniers and Mailles, but not considerable. A. This Crown here to make exchange by is equivalent to the Silver Coins of *Lewis* 13th and 14th, called *Lewis*, and imaginary, and not to be accounted for the French Gold Crown, which is a real Coin and of great Value now, being worth about 8 s. *Sterling*. The Account and Exchange agreed in reality 10 Sols then, and yea commonly reckoned for an *English* Shilling. Of this Gold Crown was the Cardecue a Quarter, and so valued in *Sterling* Money at 18 d. and should be wrote *Quartid escue*, *Escue* being French for a Crown.

B and C, the Livres (or Pounds, sometimes called Franks) and Sols (wrote sometimes Souls) derived from the Latin, *Solidus*, as *Livre* from *Libra*, are different. Those commonly used are called *Tournois*; and valued with *Sterling* Money as above. Of the Sols Barrois 14 make 20 Sols *Tournois*. The Sols *Mausais* is 2 Sols *Tournois*: The Sols *Paris* is 1½ Sols *Tournois*. The Sols *Bourdelois* is half the Sols *Paris*, and so accordingly is the Livre to be accounted.

D and E; neither the Liarts nor Doubles, though both Copper Coins, are used in common Accounts.

1. 4. *Frankfort*, their Guilder or Florin by which they reckon is 60 Creutzers divided by 20 s. and every Shilling in 12 Hellers according to the Pound. But they exchange by the Dollar of 65 Creutzers, payable in the two Yearly Fairs or Marts, one the Week before *Easter*, and the other all the Month of *September*.

1. 7. *Genoa*, all Accounts and Exchanges are made by Crowns of 60 s. divided into 20 s. and every Shilling into 12 Pence.

1. 4. *Germany*, every Batz, by which generally they keep Accounts, is 4 Creutzers: They exchange on the Dollar, imaginary at 65 Creutzers, and so coined, as was noted before at *Augusta*, though risen to 72 in Value.

They have Pieces of 3, 6, and 12 Creutzers, and by them and their Batz they value their own and *Exotic* Coins; as the *Hungarian* Ducat is 27 Batz; the Gold Guilder is 18 Batz; the *Poltz* Guilder or Dollar is 15 Batz; *Teflon* 5 Batz, &c.

A Guilder was the Name the ancient *Romans* gave to an Ounce, and 8 Ounces made a Mark, and 12 Ounces of Guilders a Pound; and there were coined Pieces called *Nunni Dragmi* or *Grosfen*, the 8th Part of a Dollar. Anno 1520 was the Gold Guilder coined for a general Coin, and valued in *Holland* at 28 Stivers, but now in *specie* at double the Price: Nevertheless Corn brought from *Poland* and the *East Countries*, is bought and sold by the same at the old Value of 28 Stivers.

Angelices was the sixth Part of a Dollar, making 3 Batz or 12 Creutzers. These Angelici becoming Tribute Pennies were alloyed, and so becoming made worse, did obtain the Name of Batz or Bats (sometimes wrote Batfes) *quasi* Bafe: And in *Thuringia* they are called *Gulielmi*, and in *Bohemia*, *Bohemici*, whereof they have also 12 Pieces dividedly for for 12 Pence, which Penny is 2 Hellers in Account all over *Germany*.

2. 6. *Goa*, their common Account is by their ordinary Silver Coin a *Pardaune Xeraphin*, having the Image of St. *Sebastian* on one Side, and 3 or 4 Arrows bound together at the other, which is worth 3 Testons, or 300 Res of *Portugal*, but varieth as the Exchange riseth or falleth; and accordingly their other Coins and Accounts, of which some are imaginary and some real. They have also some good and some bad Monies; for 4 good *Tanga's* or 5 bad *Tanga's* are reckoned to value 1 *Pardaune Xeraphin*, and 1 *Tanga* is 75 *Basarves*. Of these *Basarves* 375 make 1 *Pardaune Xeraphin*, and 15 good *Basarves* are valued with 18 bad, which are made of bad Tin. By these other Country Coins are rated, as the *Larin* of *Persia* is worth 105, and 108 *Basarves*, as the Exchange goes. A *Pardaune* of *Larins*, is 5 *Larins*, and the Crowns of *Venice* or *Turkey* are almost worth 2 *Pardaune Xeraphins*. They have also a *Pagoda*, or Gold Crown, on which is the Figure of their *Idol*, worth about 8 *Tanga's*; and Gold Crowns of St. *Thomas* with his Image on them, esteemed at 7 or 8 *Tanga's*.

1. 1. *Hamborough*, their Dollar was first coined at 31 Shillings *Lups*, and many Years current for 33, is now haunched to 54 s. *Lups*, of 3 white Penny, and every Shilling is 12 d. and every Penny 2 Hellers. They account by Marks of 16 s. *Lubish*, and 12 d. to the Shilling; but exchange for *London* upon the Pound *Sterling*, and for other Places on the Rix Dollar of 33 s. now by them inhaunched to 54 s. *Lubish*, or so many Stivers *Flemish*.

1. 8. *Henault*, as *Antois*.

1. 4. *Hungaria*, account by Guilders of 10 Shillings, of 33 d. to the Shilling; and exchange on the Ducat and Rix-Dollar, worth 8 Shillings, formerly but 7 s. 6 d.

1. 6. *Ireland*, they, as the *English*, account by Pounds of 20 Shillings *Sterling*, and Pence of 12 to the Shilling; only their *Harper*, valued in *England* but 9 d. was with them counted 1 s. so as their Pound is but ¾ of ours, or 15 s. *Sterling*; and thereon Exchanges are made.

1. 4. *Leipsick*, as *Bresla*.

1. 10. *Lisbon*: See *Portugal*.

1. 8. *Low Countries*, generally as before at *Brabant*.

1. 2. *London*, Exchanges are generally made for *Germany* and the *Low Countries* on the Pound *Sterling*; for *France* on the French Crown of 60 Sols *Tournois*; for *Italy*, *Spain* and other Places on the Ducat, Dollar or Florin, according to the Custom of the Place.

1. 7. *Luca*,

17. *Luca*, for divers Places in *Italy*, and *Lyons* in *France*, Exchanges are made on the Ducat.

1. 3. *Lyons*, as before in *France*.

1. 14. *Madrid*: See *Spain*.

1. 7. *Milan*, Accounts are kept by Ducats Imperial, divided by 20 s. and 12 d. to the Shilling, and Exchanges made on the same, accounting 80 s. to the Ducat Imperial; but they buy by a Ducat current of 120 s.

1. 7. *Naples*, they account by Ducats, Taries and Grains. The Ducat is 10 Carlini or 5 Taries, for the Tary is 2 Carlini or Royals; and hereupon Exchanges are made for most Places of *Italy*; but for *Lyons* they exchange by Number, as 125 Ducats for 100 Crowns.

1. 5. *Norembourgh*, the Exchange is made on the Dollar of 65 Creutzers, and many times on the Guilder of *Florin*, of 60 Creutzers, which they also divide into 20 s. and every Shilling into 12 d. to keep Accounts by; and some say the Creutzer is 4 d. every Penny is 2 Hellers, and 5 d. is called a *Fynfer* or 5 Pennick.

1. 7. *Palermo*, the Ducat is 13 Taries, 1 Tary 2 Carlini, 5 Ryals of *Spain* are 6 Taries. They account by Ounces of 30 Taries, to 20 Grains every Tary, and every Grain 6 Piccolie. And their Exchanges are made upon *Florins* of 6 Taries or Tarii.

1. 3. *Paris*, as before in *France*.

1. 9. *Poland*, they account by Marks, and exchange on the Dollar, and also on the *Florin* of 48 s. The Mark is one Third Part of it.

1. 4. *Pomerania*, they divide their Money as in the Next Table following, account by Marks of 16 Snudens, and Exchange upon the Rix-Dollar of 32 s. or 2 Marks Snudens, so called to distinguish them from Marks-Lups and Shillings-Lups.

	Marks-Lups.		Shillings.		Pence.		Hellers.
	Snudens.	Shillings.	Snudens.	Shillings.	Snudens.	Shillings.	
Rix-Dollar.	2	16	32	384	768		
Mark-Lups.	Mark.	8	16	192	384		
	Snudens.	Shilling-	2	24	84		
	Lups.	Shilling-	21	24			
		Snudens.	Penny	2			

1. 10. *Portugal*, they account by *Milrais*, Ducats or *Crufado's*, &c. as in the Table following, and exchange by the same Ducat of 400 Raies.

	Ducats, or Crufado's.		Teffons.		Rials.		Vintaines, or Half Rial.		Raies.
	Ducat.	Teffton.	Rial.	Half Rial.	Rial.	Half Rial.	Rial.	Half Rial.	
Mill-Raies.	2½	10	25	50	1000				
	Ducat.	4	10	20	400				
	Crufado.	Teffton.	2½	5	100				
		Rial.	2	4	40				
		Vintaine, or	20						
		Half Rial.							

Of these Ducats, Rials (or Royals) and Raies (wrote also Reas, Reyse and Rés) are most in use for Account. They have *Tefftons* also of 4 *Vintaines*; 40 Raies are commonly accounted for six Pence *Sterling*, and so accordingly were the other Coins valued till the late Advance, whereby the *Teffton* of 100 Raies were stamped and made current for 120 Raies, and so rated at 1 s. 6 d. *Sterling*, when before but 1 s. 3 d.

1. 7. *Puglia*, as *Calabria*.

1. 9. *Riga*, they buy by Dollars or *Florins Polish* of 18 Farthings, whereof 11 make 10 Dollars,

but they exchange upon the Rix-Dollar.

1. 3. *Roan*, as before in *France*.

1. 7. *Roan* Accounts and Exchanges are performed by Ducats *di Camori*, of 13 July or *Guilt*, every Ducat, which they divide into 20 s. and every Shilling into 12 d.

1. 11. } *Ruffia*, they have small Coin of 11 Oz.

2. 10. } Penny Weight fine, called *Dengen*, whereof 320 Pieces weigh but a Mark of 8 Oz. They exchange upon the Dollar of *Germany*; but for *London* upon their Rubble, which is valued as a double Ducat, formerly accounted to a Mark *Sterling*, or 13 s. 4 d.

1. 14. *Saragossa*, as *Arragon*.

1. 12. *Scotland*, they account by Pounds, Shillings and Pence as in *England*, but one Pound *Scotch* is but 20 d. *English*. Their Mark is 13½ s. *Scotch*, current in *England* at 13½ d. Their Noble or half Mark with them 6½ s. with 5 6½ d. their half Noble and third Part of their Noble proportionably. They have also Turnoners, Pence and Half-pence; and base Money of Bodles, Achifons, Babees, Placks, &c. accounting 6 Bodles to 1 d. *Sterling*, or 12 d. *Scotch*; 4 Bodles to 1 *Achifon*, 3 to 1 *Babee*, and 2 to 1 *Plack*; but they exchange upon their Mark.

1. 14. *Spain*, as in *Madrid*, *Sevil*, and other Places their Accounts are kept by *Malvedies*, or *Marvedies* (wrote also *Merveides* and *Meravides*) whereof 375 are esteemed to make a Ducat of 11 Rials, tho' really every Rial is 34 *Marvedies*, and so maketh but 374, as in the Table following; and so others keep Accounts accordingly. Exchange is made on this imaginary Ducat of 375 *Marvedies*, to be paid in Bank with 5 on the 1000, which is the Salary of the Banker; or without the Bank to be paid without the same.

	Pieces of Eight.		Rials.		Quartillo's.		Marveides.		Carnado's.
	Piece of Eight.	Rial.	Quartillo.	Marveid	Piece of Eight.	Rial.	Quartillo.	Marveid	
Ducat.	1½	11	44	374	2244				
	Piece of Eight.	8	32	272	1632				
		Rial.	4	34	204				
			Quartillo.	8½	51				
				Marveid	6				

A Rial is about 6½ d. *Sterling*.

1. 4. *Straßborough* or *Strausburgh*, they have *Blapharts*, *Grofs*, *Behemico's*, all current for 3 Creutzers apiece, 1 Creutzer at 2 d. one Penny at 2 Hellers, and 1 Heller at 2 Orthings.

1. 15. *Sweden*, they reckon by Marks, whereof 8 make a Dollar, whereupon they exchange: And 2 Marks make a Clipping of 9 Stivers.

1. 4. *Tirol*, the Dollar is 72 Creutzers, and the Creutzer 5 Fynfers or Hellers.

2. 11. *Tripoli*, as *Aleppo*.

1. 14. *Valentia*, as *Arragon*.

1. 7. *Venice*, Thirty Bats make 1 *Souldey*, and 20 *Souldeys* 1 *Livre* of *Venice*. Their Gold Ducat is valued equal to 40 Maides of *Alexandria*. They have also Copper Money, 1 *Seffini* make 2 *Quatrini*, and 1 *Quatrino*, 4 *Bagatini*, and so 3 *Quatrini*, or 12 *Bagatini* make an Half-penny *Sterling*, or thereabouts.

They account by Pounds *Flemish* of 10 Ducats of 20 Shillings, and divide the Ducat into 24 *Grofs*, and the Shilling into 12 d. and also by the Ducat 124 s. called *Ducato di Banco*, or *Current*, and thereupon Exchanges are made.

1. 7. *Verona*, their Accounts are kept by 20 s. and 12 d. to the Shillings; and they exchange upon the Ducat of 93 s.

1. 4. *Vienna*, both Accounts and Exchanges are kept and made by *Guilders* or *Florins* of 8 s. a piece, 30 d. to the Shilling; and 2 Hellers to the Penny.

They esteem the Rix-Dollars at 8 s. and the Ducat at 12 s.

1. 4. *Ulm*, they reckon by Pounds of 20 s. and 12 Hellers to the Shilling; and exchange on the Dollar of 60 Creutzers.

Foreign Gold.		Fine	Pieces	Weight by	Weight	Old Value.			New Value.		
		Car. gr.	to the lb. Tr.	Malines. pwt. gr.	by others pwt. gr.	l.	s.	d.	l.	s.	d.
Albertines: See Ducats.											
Angels of	{	with 3 Lions, with O,	22 0	76	3 3 $\frac{3}{4}$	3 3 $\frac{3}{4}$	0	8	6	0	11 0 $\frac{1}{2}$
			23 0	72	3 8	3 6	0	9	0	0	12 2 $\frac{1}{4}$
			21 3	72	3 8	3 6	0	9	0	0	11 6 $\frac{1}{4}$
			23 0	72	3 8	3 6	0	9	0	0	12 2 $\frac{1}{4}$
			17 0	72	3 8	3 6	0	9	0	0	9 0
			23 1 $\frac{1}{2}$	72	3 8	3 6	0	9	6	0	12 4 $\frac{3}{4}$
			22 1 $\frac{1}{2}$	72	3 8	3 6	0	9	0	0	11 10 $\frac{1}{2}$
			18 3	72	3 8	3 6	0	7	6	0	9 11 $\frac{1}{4}$
			23 3	79 $\frac{1}{4}$	3 0 $\frac{7}{16}$	2 33	0	8	10	0	11 4 $\frac{3}{4}$
			22 0	72	3 8	3 6	0	11	0	0	11 8
			22 0	144	1 16	1 15	0	5	0	0	5 10
			22 0	108	2 5 $\frac{1}{2}$	2 5	0	6	6	0	7 9 $\frac{1}{4}$
			23 3	100 $\frac{1}{2}$	2 9 $\frac{1}{2}$	2 9	0	7	0	0	9 8 $\frac{1}{4}$
			23 3	100 $\frac{1}{2}$	2 9 $\frac{1}{2}$	2 9	0	7	0	0	9 0 $\frac{1}{2}$
			22 0	108	2 5 $\frac{1}{2}$	2 5	0	6	0	0	7 9 $\frac{1}{2}$
Crowns.	{	Some Others	22 0	107 $\frac{1}{2}$	2 5 $\frac{1}{2}$	2 5 $\frac{1}{2}$	0	6	0	0	7 9 $\frac{1}{4}$
			22 0	108	2 5 $\frac{1}{2}$	2 5	0	6	0	0	7 9 $\frac{1}{4}$
			22 1 $\frac{1}{2}$	107 $\frac{1}{2}$	2 6 $\frac{1}{2}$	2 6 $\frac{1}{2}$	0	6	0	0	7 11 $\frac{1}{4}$
			22 0	108	2 5 $\frac{1}{2}$	2 5	0	6	0	0	7 9 $\frac{1}{4}$
			22 0	186	1 6 $\frac{1}{2}$	1 6 $\frac{1}{2}$	0	4	4 $\frac{1}{4}$	0	6
			22 1	105	2 6 $\frac{1}{2}$	2 6 $\frac{1}{2}$	0	6	0	0	8 1
			22 3	105	2 6 $\frac{1}{2}$	2 6 $\frac{1}{2}$	0	6	2	0	8 3 $\frac{1}{4}$
			23 3	10 $\frac{1}{2}$	22 20 $\frac{4}{7}$	22 16	3	8	0	4	6 4 $\frac{1}{2}$
			22 3	10 $\frac{1}{2}$	22 20 $\frac{4}{7}$	22 16	3	5	0	4	2 8 $\frac{1}{2}$
							0	14	6	0	15 2
							0	6	6	0	8 8
			23 3 $\frac{1}{2}$	105	2 6 $\frac{1}{2}$	2 6 $\frac{1}{2}$	0	6	6	0	8 8
			23 3 $\frac{1}{2}$	52 $\frac{1}{2}$	4 13 $\frac{1}{2}$	4 13	0	13	0	0	17 4
			23 3	78 $\frac{1}{2}$	3 1 $\frac{1}{2}$	3 0	0	9	0	0	11 5 $\frac{1}{4}$
			Crusado's.	{	Single Double	23 3	52 $\frac{1}{2}$	4 13 $\frac{1}{2}$	4 13	0	13
23 3	70 $\frac{1}{2}$	3 9 $\frac{1}{2}$				3 9	0	10	0	0	12 10 $\frac{1}{4}$
23 3	126	1 21 $\frac{1}{2}$				1 21 $\frac{1}{2}$	0	5	7	0	7 2
23 3	105	2 6 $\frac{1}{2}$				2 6 $\frac{1}{2}$	0	6	6	0	8 7 $\frac{1}{2}$
23 0 $\frac{1}{2}$	106 $\frac{1}{2}$	2 6 $\frac{1}{2}$				2 6	0	6	4	0	8 3 $\frac{1}{2}$
23 3	106 $\frac{1}{2}$	2 6 $\frac{1}{2}$				2 6	0	6	6	0	8 6 $\frac{1}{4}$
19 0	105	2 6 $\frac{1}{2}$				2 6 $\frac{1}{2}$	0	5	2	0	6 11
23 0 $\frac{1}{2}$	105	2 6 $\frac{1}{2}$				2 6 $\frac{1}{2}$	0	6	3	0	8 5 $\frac{1}{2}$
23 3	105	2 6 $\frac{1}{2}$				2 6 $\frac{1}{2}$	0	6	6	0	8 7 $\frac{1}{2}$
20 0	106 $\frac{1}{2}$	2 6 $\frac{1}{2}$				2 6	0	5	4	0	7 2
23 3	105	2 6 $\frac{1}{2}$				2 6 $\frac{1}{2}$	0	6	6	0	8 7 $\frac{1}{2}$
18 0	106 $\frac{1}{2}$	2 6 $\frac{1}{2}$				2 6	0	4	10	0	6 5 $\frac{1}{2}$
19 0 $\frac{1}{2}$	106 $\frac{1}{2}$	2 6 $\frac{1}{2}$				2 6	0	5	2	0	6 10 $\frac{1}{2}$
23 1	108	2 5 $\frac{1}{2}$				2 5	0	6	4	0	8 2 $\frac{1}{2}$
Ducats of	{	Single Double				21 3	106 $\frac{1}{2}$	1 6 $\frac{1}{2}$	1 6	0	6
			23 1	106 $\frac{1}{2}$	2 6 $\frac{1}{2}$	2 6	0	6	3	0	8 4
			21 3	52 $\frac{1}{2}$	4 13 $\frac{1}{2}$	4 13	0	12	4	0	15 9 $\frac{1}{4}$
							7	2	0	8 9	
			23 2	105	2 6 $\frac{1}{2}$	2 6	0	6	5	0	8 6 $\frac{1}{4}$
			23 3 $\frac{1}{2}$	113 $\frac{1}{2}$	2 2 $\frac{1}{2}$	2 2 $\frac{1}{2}$	0	6	4	0	8 0
			23 1	104 $\frac{1}{2}$	2 7 $\frac{1}{2}$	2 7 $\frac{1}{2}$	0	6	4	0	8 5 $\frac{1}{4}$
			23 1	106 $\frac{1}{2}$	2 6 $\frac{1}{2}$	2 6	0	6	3	0	8 4
			23 1	52 $\frac{1}{2}$	4 13 $\frac{1}{2}$	4 13	0	13	0	0	16 10 $\frac{1}{4}$
			20 0 $\frac{1}{2}$	106 $\frac{1}{2}$	2 6 $\frac{1}{2}$	2 6	0	5	4	0	7 2 $\frac{1}{2}$
			21 1	52 $\frac{1}{2}$	4 13 $\frac{1}{2}$	4 13	0	12	0	0	5 5 $\frac{1}{2}$
			18 2	108	2 5 $\frac{1}{2}$	2 5	0	4	10	0	6 6 $\frac{1}{2}$

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	Oswald Ducat Grusa, Pancratius Alleb. H. as Oswald. Peter Rechem, as Geo. Rechem. Portugal : See Crusado's, Milreys.	19	0½	106½	2	6⅞	2	6	0	5	2	0	6	10½
Ducats of	Rome, { Single, { Some, { Double, { Others,	23	3	105	2	6⅞	2	6½	0	6	6	0	8	7½
	S. Victor Rancratius, as Geo. Rechem,	23	3	106½	2	6⅞	2	6	0	6	6	0	8	6½
	Spain, { Single, { Some, { Double, { Others, Great	23	1	105	2	6⅞	2	6½	0	6	6	0	8	5½
	States of the Un. Prov. with Letters; The Half thereof,	23	2	52½	4	13½	4	13	0	13	0	0	17	1
	Stephanus of Batenborgh,	22	0	24	10	0	10	0	1	10	0	1	15	0
	Suevia,	22	0	52½	4	13½	4	13	0	12	4	0	16	0
	Valence,	22	0	105	2	6⅞	2	6½	0	6	2	0	8	0
	Venice,	19	0½	52½	4	13½	4	13	0	10	5	0	13	10½
	Viñor Batenborgh, as Geo. Rechem; Viñor H. B. as Mary of Batenborgh, W. B. Margaret Toren, Water Ducats, as Mary of Baten.	23	1	104½	2	7⅞	2	7	0	6	3	0	8	5½
	Zeland, { Single, { Double,	23	3	105	2	6⅞	2	6½	0	6	6	0	8	7½
	Ducat with the Chequer, as Den. Floret of France, The new Floret: See Gilden. St. And Golden Fleece, or Toyson d'Or; Golden Guilder, or Guildren,	23	3	106½	2	6⅞	2	6	0	6	1	0	7	9½
	St. Andrew, { Old, { New, or Floret,	23	0½	105	2	6⅞	2	6½	0	6	3	0	8	5½
	Arnoldus, Carolus, Clemmer, Collen,	23	0½	52½	4	13	4	13½	0	12	6	0	16	11
	David of the Harp, Triers, Utrecht,	22	0	100½	2	9¾	2	3	0	6	5	0	8	4½
	Frederick of Bavaria, Guelmus, Horne, Joannes, Peter of Louvaine, Philip, The Half thereof,	23	3¼	81½	2	2¼	2	2½	0	9	2	0	11	3¼
	Renisb Guilder, Saxon, States of the United Provinces, Lyons, Golden Lyon of Flanders, Part thereof, Part thereof, Louisdes of Louis 13 & 14 of France, The Half thereof,	18	3	112½	2	3½	2	6	0	4	6	0	6	4¼
	Mark of Bohemia, 20 Marks of Scotland, 10 Marks of Scotland, 5 Marks of Scotland, 6 Marks of Suevia, Milreys or Ducan of Portugal, Half Milreys, Counterfeit Milreys, Bridges, Half Flemish Noble, Flanders, or Flemish Noble, Gaunt, Half Noble, as the Hungary Ducat. Noble, with the Lion, as Bridges. Henry Noble of France, The Half thereof, Holland, Overijssel and } as Holland. Utrecht Zeland, as Gaunt.	18	1	108	2	5½	2	3½	0	4	10	0	6	5½
		12	0	138	1	17½	1	17½	0	2	7	0	3	3¾
		14	0	126	1	21½	1	21½	0	3	6	0	4	2½
		13	0	114	2	2½	2	2	0	3	6	0	4	4½
		17	3	114	2	2½	2	2½	0	4	8	0	5	11½
		15	0	114	2	2½	2	2	0	4	0	0	5	0½
		17	2	114	2	2½	2	2	0	4	8	0	5	10½
		16	0	114	2	2½	2	2	0	4	3	0	5	4½
		14	0	117	2	1½	2	1	0	3	8	0	4	6½
		18	1	108	2	5½	2	5	0	5	10	0	6	5½
		16	0	158½	1	12¾	1	12½	0	4	11	0	6	4
		16	0	109½	2	4½	2	4½	0	4	6	0	5	7½
		17	0½	114	2	2½	2	2	0	4	5	0	5	8½
		15	3	111	2	3½	2	3½	0	4	2	0	5	5
		15	3	222	1	1½	1	1½	0	2	1	0	2	8½
		22	0	102½	1	8¼	2	8	0	6	0	0	8	2
		17	3	113	2	2½	2	2½	0	4	8	0	5	11½
		20	0	120½	1	23½	1	23½	0	4	8	0	6	3¼
		20	0	89½	1	16½	2	16½	0	7	8	0	10	1½
		23	3	133½	1	19½	1	19	0	4	11	0	6	9
		23	3	267½	0	21½	0	21½	0	2	5	0	3	4
		22	0	54	4	10½	4	8	0	15	0	0	15	6½
		22	0	108	2	5½	2	4	0	7	6	0	7	9½
		22	0	36	6	16	6	10	1	2	0	1	3	4
		22	0	72	3	8	3	3	0	11	0	0	11	8
		22	0	144	1	16	1	14	0	5	6	0	5	10
		22	1	48	5	0	4	20	0	13	4	0	17	8¼
		22	1	96	2	12	2	10	0	6	8	0	8	10
		21	0	48	5	0	4	20	0	12	6	0	16	8½
		23	0	88½	2	17½	2	17	0	7	4	0	9	11
		23	0	108	2	5½	2	5	0	6	0	0	8	1½
		33	0	54	4	10½	4	10	0	12	0	0	16	3
		23	0	54	4	10½	4	10	0	12	0	0	16	3
		22	0	51	4	16½	4	16	0	13	4	0	16	5½
		22	2½	108	2	5½	2	5	0	6	8	0	7	7½
		23	2	48	5	0	4	20	0	14	3	0	18	10½

C O I

Foreign

Foreign Silver.

		Fine oz. pwt.	Pieces to the lb. Troy	Weight of the Pieces oz. pwt. gr.	Sterling Value s. d.	Value by some Auth. s. d.
Albi of	Bamberg,	4 18	273	0 0 21 ⁹ / ₁₀	0 1 +	0 1
	Collen, { Some Others Others	5 10	345	0 0 16 ⁶ / ₁₀	0 1 +	0 1
		5 10	342	0 0 16 ⁶ / ₁₀	0 1 +	0 1
		5 10	179	0 1 8 ³ / ₁₀	0 2 -	0 2
	Frankford, as Bamberg.					
Batz of 4 Creutzers	Mentz, as Collen,					
	Norembergh and Palatine of the Rhine, } as Bamberg.					
	Trier, as Collen.					
	Alteen, or Atten of Muscovia,					0 4 +
	Altime of Poland,					0 4 +
	Angel of Strickelborgh,	10 7 ¹ / ₂	78 ¹ / ₂	0 3 1 ¹ / ₂	0 8 ¹ / ₂ +	0 8
	Asper of Turkey,					0 1 ¹ / ₂
	Babee of Scotland,					0 0 ¹ / ₂
	Bavaria,					
	Brandenburgh,					
3 Carolus of	Colmogrove,					
	Cost of 1530,					
	Friburgh,					
	Ortinge,	5 7	109 ¹ / ₂	0 2 4 ⁴⁴ / ₁₀	0 3 +	0 3
	Reynsburgh,					
	Roy,					
	Scaffusen,					
	Taunte,					
	Kemptor half Batz,	4 12 ¹ / ₂	192 ¹ / ₂	0 1 5 ⁷ / ₁₀	0 1 ¹ / ₂ +	0 1 ¹ / ₂
	Munchien half Batz,	4 12 ¹ / ₂	186	0 1 6 ³ / ₁₀	0 1 ¹ / ₂ +	0 1 ¹ / ₂
Cruciats, Creutzers or Croffes,	3 Batz : See Snappane,					
	Bemes, or Bemis of Switz.					
	Bianco, or Bianco of Italy,					0 2 ¹ / ₂
	Blanks,					0 8
	Half Ruyters Blank of Holland,	3 0	144	0 1 16	0 1 ¹ / ₂ +	0 0 ¹ / ₂
	Boligno,					0 1 ¹ / ₂
	Carlini of Italy,					0 0 ¹ / ₂
	Carolus Guilder, as ² / ₃ of the Philip's Dollar.					0 6
	Carolus and Salsburgh,					
	Campidona,					
Cruciats, Creutzers or Croffes,	Ernestus,					
	Frankford,	9 0	78 ³ / ₄	0 3 1 ¹ / ₂	0 7 ¹ / ₄ +	0 7
	Ortingus,					
	Patavia,					
	Reynsborgh,					
	Causlero or Cavelero of Italy,					0 3 ¹ / ₂
	Cruciat of John of Cleve,	8 7	39 ¹ / ₂	0 6 0 ⁸ / ₁₀	0 1 ¹ / ₂ +	0 1
	of Ansburch and Ulm,	5 5	384	0 0 15	0 0 ¹ / ₂ +	0 0 ¹ / ₂
	of Poland,					0 0 ¹ / ₂
	12 Creutzers of { Bavaria, Vienna, }	8 7 ¹ / ₂	57	0 4 5 ⁹ / ₁₀	0 9 ¹ / ₂ +	0 9
Cruciats, Creutzers or Croffes,	Other 12 Creutzer Pieces, And some	8 7 ¹ / ₂	61 ¹ / ₂	0 3 21 ¹ / ₁₀	0 8 ¹ / ₂ +	0 9
	10 Creutzers of { Frise, Ravenburgh, Salsburgh, Saxony, }	10 10	same	same,	0 11 +	0 11
	6 Creutzers of { Insburgh, Vienna, }	8 7 ¹ / ₂	64 ¹ / ₂	0 3 17 ² / ₁₀	0 8 ¹ / ₄ +	0 8
	Other 6 Creutzer Pieces,	10 10	124 ¹ / ₂	0 1 22 ² / ₁₀	0 5 ¹ / ₂ -	0 5
	3 Creutzers of { Bavaria, Vienna, }	8 7 ¹ / ₂	114	0 2 21 ⁸ / ₁₀	0 4 ¹ / ₂ +	0 5
	Other 3 Creutzer Pieces,	10 10	123	0 1 22 ¹ / ₁₀	0 5 ¹ / ₂ +	0 5
	2 Croffes and Harpe,	4 8	375	0 1 15 ¹ / ₁₀	0 0 ¹ / ₂ +	0 0 ¹ / ₂
	Crowns of { France : See Louis, Italy, Turkey,	4 8 ¹ / ₂	129	0 1 20 ¹ / ₁₀	0 2 ¹ / ₄ +	0 2
	Cupstoke,	5 10	136 ¹ / ₂	0 1 80 ¹ / ₁₀	0 2 ¹ / ₄ +	0 2
	Deghen or Denghen } of { Muscovia and de Narde Russia, }	4 0	180	0 1 8	0 1 ¹ / ₄ +	0 1 ¹ / ₄

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[illegible]

	I	O	450	O	8	12 $\frac{1}{2}$	O	0 $\frac{1}{2}$ +	Not cur. in E
Maille, old Petir Maille,	5	8 $\frac{1}{2}$	27	0	8	21 $\frac{1}{2}$	I	1+	I I
Magenburg, 3 Arms,	II	3 $\frac{1}{2}$	51	0	4	16 $\frac{1}{2}$	I	2+	I 2
Other Piece,									2 2
Mark of Denmark,									I 1 $\frac{1}{2}$
Mark of Scotland,	II	2	54	0	4	10 $\frac{3}{4}$	I	1 $\frac{1}{2}$ +	I 1 $\frac{1}{2}$
Half and Quarter accordingly.									2 2
Markstick of Lady Mary.	IO	16 $\frac{1}{2}$	27	0		8 21 $\frac{1}{2}$	2	2+	2 2
Lubeck,									0 2 $\frac{1}{2}$
Medine of Cairo,									0 11
Murfengio,	6	0	140	0	I	17 $\frac{1}{2}$	0	2 $\frac{1}{2}$ +	0 3
Nummi Dragme, { Some,	6	2	118 $\frac{1}{2}$	0	2	04 $\frac{3}{4}$	0	3 $\frac{1}{2}$ +	0 3
{ Others,	5	7	924	0	0	6 $\frac{3}{4}$	0	0 $\frac{1}{2}$ +	0 3
{ Bohemia, { White,	2	13 $\frac{1}{2}$	990	0	0	5 $\frac{1}{2}$	0	0 $\frac{1}{2}$ +	0 2
{ Holland { Black,	0	19	518	0	2	11 $\frac{1}{2}$	0	2 $\frac{1}{2}$ +	0 2
Penny of,	4	10	120	0	I	0	0	1+	0 I
Penny called Brags Penny,	4	10	240	0	0	22 $\frac{1}{2}$	0	1+	0 4 $\frac{3}{4}$ or 2 $\frac{1}{2}$
Half thereof,	4	14	256	0					0 6
Half Ruyers Black Penny,									0 5
Pfound, or Pfound,									0 10 $\frac{1}{2}$
Plappot,									0 5 $\frac{1}{2}$
Poals of Italy,	II	2							0 6
Pound, 3 Pound of Scotland,	II	2							0 2 $\frac{1}{2}$
Polpate, as Baldpate of Scotland,	II	2							0 2 $\frac{1}{2}$
Half thereof,	IO	6 $\frac{3}{4}$	39 0	0	6	3 $\frac{2}{3}$	I	5+	I 4
Quartid'esse, or { France,	9	8 $\frac{1}{2}$	39 0	0	6	3 $\frac{1}{3}$	I	3 $\frac{1}{2}$ +	I 6
{ Lorrain,	IO	16 $\frac{1}{2}$	39 0	0	6	3 $\frac{2}{3}$	0	6+	I 6
Quart-Crow of { Philip,									0 2 $\frac{1}{2}$
{ Savoy,									0 1 $\frac{1}{2}$
Rappen Munz,									0 6
Rouftick,	IO	15	120	0	2	0	0	5 $\frac{1}{2}$ +	0 6
Abertus of Austria,	IO	15	40	0	6	0	0	5 $\frac{1}{2}$ +	0 6
Half and Quarter accordingly,	9	17	108	0	2	5 $\frac{1}{3}$	0	5 $\frac{1}{2}$ +	0 6
Pieces of his of 3 Ryals,	9	14	108	0	2	5 $\frac{1}{3}$	0	5 $\frac{1}{2}$ +	0 6
Italy, { Some,	9	11	108	0	2	5 $\frac{1}{3}$	4	4+	4 4
{ Others,	II	0	13 $\frac{1}{2}$	0	17	13 $\frac{2}{3}$	0	4+	0 4
Mexico 8 Ryals,	7	0	108	0	2	5 $\frac{1}{3}$	0	4+	0 6
Rome, Course Ryals,	II	3 $\frac{1}{2}$	108	0	2	5 $\frac{1}{3}$	0	6 $\frac{1}{2}$ +	4 4
Spain,	II	4	13 $\frac{1}{2}$	0	17	18 $\frac{2}{3}$	5	5 $\frac{1}{2}$ +	4 4
Spanish 8 Ryals, called Pieces of Eight	IO	0	10 $\frac{1}{2}$	0	2	9 $\frac{1}{2}$	5	0 $\frac{1}{2}$ +	5 0
States General of the United Provinces,									
The twentieth part of the same, with	II	10	96	0	2	12	0	7 $\frac{1}{4}$ +	0 8
the Arrows accordingly.	9	0	12 $\frac{1}{2}$	0	19	22 $\frac{1}{2}$	4	0 $\frac{1}{2}$ +	4 0
Venice,	II	10	96	0	2	12	0	7 $\frac{1}{4}$ +	0 8
Ryder of Guelders and Friesland,	IO	6 $\frac{1}{2}$	146 $\frac{1}{2}$	0	I	15 $\frac{2}{3}$	0	4 $\frac{1}{2}$ +	0 4 $\frac{1}{2}$
Salvator of Venice,									0 6
Saffenars double,									0 1 $\frac{1}{2}$
Scaby of Turkey,									0 6 $\frac{1}{4}$
Schaneberger,									0 2 $\frac{1}{2}$
Sca of Turkey,	5	7	129	0	I	20 $\frac{3}{4}$	0	2 $\frac{1}{2}$ +	0 1 $\frac{1}{2}$
Sennbe, or Snnbe of Bohemia,	5	7	258	0	0	22 $\frac{1}{4}$	0	1 $\frac{1}{2}$ +	0 1 $\frac{1}{2}$
Half thereof,									0 0 $\frac{1}{2}$
Setling,	5	0	57	0	4	5 $\frac{1}{2}$	0	5 $\frac{1}{2}$ +	0 5
Bridges of 1582,									0 0 $\frac{1}{4}$
Danzick,	IO	12	156	0	I	12 $\frac{1}{3}$	0	4 $\frac{1}{2}$ +	0 4
8 Shillings of Danzick of 1541,									0 7 $\frac{1}{2}$
Flanders,	6	0	57	0	4	5 $\frac{1}{2}$	0	6 $\frac{1}{2}$ +	0 6
Friesland of 1586,	7	7	54	0	4	10 $\frac{2}{3}$	0	8 $\frac{1}{4}$ +	0 9
Gauvi of 1583,									0 5 $\frac{1}{4}$
Germany,									0 9 $\frac{3}{4}$
Guelders, as Friesland,									0 1 $\frac{1}{4}$
Hamborough,									0 5
Lubeck,	II	3	135	0	I	18 $\frac{2}{3}$	0	5 $\frac{1}{2}$ +	0 I
M. E. and Philip of Flanders,									0 1 $\frac{1}{4}$
Scotland,									
Switz, of Helvetia,									0 1 $\frac{1}{4}$
Utrechr, as Friesland.									0 1 $\frac{1}{4}$
Zeland,									0 1 $\frac{1}{4}$
Sicherling,	7	7 $\frac{1}{2}$	39 $\frac{3}{4}$	0	6	0 $\frac{3}{4}$	I	0+	I 0
Snaphanen, coined for 3 Batz,									
Snaphanen of { Cleve,	7	II	48	0	5	0	0	10+	0 10
{ Deventer,									
{ Nimmegben,									

Soldi of Genoa,	5	6 $\frac{1}{2}$	157 $\frac{1}{2}$	0	I	12 $\frac{4}{7}$	0	2	+	0	0 $\frac{3}{4}$
Soli of Wersburgh, Danzick, and Prussia,										0	2
Souls or Sols of France,										0	I
Souls stamped, called Souls Marque,										0	1 $\frac{1}{2}$
The old Souls with +,	4	5	175	0	I	8 $\frac{1}{2}$	0	1 $\frac{1}{2}$	+	0	2 $\frac{1}{2}$
Ordinary French Souls,	3	10	147	0	I	15 $\frac{9}{25}$	0	1 $\frac{1}{2}$	+	0	1 $\frac{1}{4}$
Late French Souls,	3	6 $\frac{1}{2}$	147	0	I	15 $\frac{9}{25}$	0	1 $\frac{1}{2}$	+	0	I
Double Hand of one Souls,	3	15	132	0	I	19 $\frac{7}{11}$	0	1 $\frac{1}{2}$	+	0	1 $\frac{1}{4}$
Two Souls Pieces, or Boubles,	6	6 $\frac{2}{3}$	117	0	2	11 $\frac{1}{3}$	0	3 $\frac{1}{2}$	—	0	3
Four Souls Pieces accordingly.											
Cambray,	3	5	135	0	I	18 $\frac{3}{4}$	0	1 $\frac{1}{2}$	+	0	1 $\frac{1}{4}$
Embsen,										0	1 $\frac{1}{4}$
Gaunti of 1583,	3	0	175 $\frac{1}{2}$	0	I	8 $\frac{1}{2}$	0	I	+	0	I
Groenghen, } as Cambray.											
Liege,											
States General of the United Provinces,	4	0	168	0	I	10 $\frac{3}{5}$	0	1 $\frac{1}{2}$	+	0	1 $\frac{1}{4}$
Utrecht,	3	0	167	0	I	10 $\frac{3}{5}$	0	I	+	0	I
Old Styver,	3	14 $\frac{1}{2}$	120	0	2	0	0	2	+	0	2
New Styver,	3	13 $\frac{1}{2}$	120	0	2	0	0	2	—	0	2
Half Styver,	3	10	201	0	I	4 $\frac{4}{7}$	0	I	+	0	I
Quarter Styver Oort,	I	17 $\frac{1}{2}$	158	0	I	12 $\frac{1}{2}$	0	0 $\frac{1}{4}$	+	} Not cur. in Eng.	
Eighth part Styver Duyt,	I	14	474	0	0	12 $\frac{1}{2}$	0	0 $\frac{1}{4}$	+		
Old double Styver,	7	7 $\frac{1}{2}$	120	0	2	0	0	4	—	0	4
Old 3 Styvers,	II	3 $\frac{1}{2}$	120	0	2	0	0	6	+	0	6
Old four Styvers { with the Eagle, Charles, and Philip, }	7	7 $\frac{1}{2}$	60	0	4	0	0	8	—	0	8
Three Styvers or Fleece,	IO	IO	IO8	0	2	5 $\frac{1}{2}$	0	6 $\frac{1}{2}$	+	0	6
Flemish six Styvers,	IO	0	54	0	4	10 $\frac{1}{2}$	I	0	+	I	0
The Bre, 1492, } 3 Styvers,	IO	4	156	0	I	12 $\frac{1}{2}$	0	4	—	0	4
The Key and Joan, }											
Five Styvers { Cambray, { Some, of { Others,	6	6 $\frac{1}{2}$	48	0	5	0	0	8 $\frac{1}{2}$	+	0	8
{ Guelders,	6	6 $\frac{1}{2}$	51	0	4	16 $\frac{1}{7}$	0	8	+	0	8
{ Horne, as Cambray.	8	1 $\frac{1}{2}$	48	0	5	0	0	10 $\frac{1}{2}$	+	0	IO
{ Liege, { Some, { Others,	7	II	48	0	5	0	0	10	+	0	IO
{ Others,	6	6 $\frac{1}{2}$	48	0	5	0	0	8 $\frac{1}{2}$	+	0	8
	6	6 $\frac{1}{2}$	51	0	4	16 $\frac{1}{7}$	0	8	+	0	8
	IO	10 $\frac{1}{2}$	39	0	6	3 $\frac{1}{3}$	I	5 $\frac{1}{2}$	+	I	5
Baden, Chrysofome,											
Berne, { Ottaman, { Vincent,	II	5 $\frac{1}{8}$	45	0	5	8	I	4	+	I	4
Castile, as Berne.											
Ferrare, Hercules, and Alphonfus,	II	5 $\frac{1}{8}$	45	0	5	8	I	4	+	I	4
France Francisus,	IO	7	42	0	5	17 $\frac{1}{7}$	I	4	—	I	4
Friburg Nicholas, as Berne.											
Geneva,	IO	4 $\frac{1}{2}$	42	0	5	17 $\frac{1}{7}$	I	3 $\frac{3}{4}$	+	I	4
Lorrain of 1524 and 1529,	IO	7	42	0	5	17 $\frac{1}{7}$	I	4	—	I	4
Lucerno, Episcopus, } as Bern.											
Mantua, Francis, }											
Milan { Galleacius and { Ludovicus,	II	5 $\frac{1}{8}$	45	0	5	8	I	4	+	I	4
Montferat, George, and Guil.	IO	4 $\frac{1}{2}$	42	0	5	17 $\frac{1}{7}$	I	3 $\frac{3}{4}$	+	I	4
Navarre { Hericus, } as Baden.											
{ Anna, }											
Portugal, Jo. V. L.	IO	7	42	0	5	17 $\frac{1}{7}$	I	4	—	I	4
Savoy, Carolus, { Some, { Others,	II	5 $\frac{1}{8}$	45	0	5	8	I	4	+	I	4
Sedun Nicol, Dan. Adrian,	IO	10 $\frac{1}{2}$	39	0	6	3 $\frac{1}{3}$	I	5 $\frac{1}{2}$	+	I	5
Solod, Ursus, as Berne.	II	5 $\frac{1}{8}$	45	0	5	8	I	4	+	I	4
Turones of France,	IO	18	26 $\frac{1}{4}$	0	9	3 $\frac{1}{2}$	2	2 $\frac{3}{4}$	+	2	2
Vieryfers, Double, Single accordingly.	4	IO	138	0	I	17 $\frac{1}{2}$	0	2	+	0	2

English Coins.

4 Farthings }
12 Pence } make 1 { Penny.
20 Shillings } Shilling.
Pound.

s. d.
A Noble is 6 8
A Mark is 13 4

Spanish Coins.

6 Carnadoes }
54 Marveids } make 1 { Marveid.
11 Ryals } Royal, 6 d. English.
8 Ryals } Ducat.
4 Quartiles } Piece of 8 = 4 s. Engl.
Royal.

Portugal Coins.

40 Res	} make 1	Ryal = 6 d. Engl.
2½ Ryals		Teffoon
4 Teffoons or		Ducat.
10 Ryals		
2½ Ducats		Milt of Gold.

French Coins.

12 Deniers	} make 1	Souls.
20 Souls		Frank or Liver.
16 Souls		Cardecu.
4 Cardecues		Crown.

Engliff Coins.

8 Pence	} is 1	Groot.
2 Groots		Single Stiver.
2 Single Stivers		Doub. Stiv. = 3½ d. E.
20 Single Stivers or 10 double Stivers		Gilder.
6 Guilders		Pound.

Scotch Coins.

1 Small Piece	} is 1	2½ d. Engliff.
3 Small Pieces		Noble = 6¼ d. Engliff.
2 Nobles		Mark = 13½ d. Engliff.
3 Nobles		1 l. Scotch = 20 d. Engliff.

Iriff Coin.

1 Harper is two 4½ d. = 9 d. Engliff.
20 Harpers is 1 l. Iriff, or 15 s. Engliff.

A TABLE of English Gold Coins, shewing their Weight, Fineness, Value, &c.

<i>Names of the Pieces.</i>	<i>Pieces to the lb. Tr.</i>	<i>Weight by Malines, &c.</i>				<i>Common Weight.</i>				<i>Pieces to the lb. Tr.</i>	<i>Fine</i>		<i>Value 1640.</i>			<i>Value 1660.</i>			<i>Alt.</i>
		<i>lb.</i>	<i>Tr.</i>	<i>pwt.</i>	<i>gr. m. dr.</i>		<i>pwt.</i>	<i>gr. m. dr.</i>		<i>Car.</i>	<i>gr.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>gr.</i>	
Old double Rose Noble,	23½	10	6	8	8½ ¹⁰ ₁₄₇	10	0	0	24	23 3¼	1	16	4	1	18	8	5		
Double Rose Noble of { Henry 8. Edward 6. Philip and Ma. Elizabeth,	24	10	0	0	0	9	22	0	0	24½	23 3¼	1	16	0	1	18	4	5	
Great Sovereign of K. James,	24	10	0	0	0	9	16	5	3½ ¹⁰ ₁₄₇	24½	22	0	1	13	0	1	15	3	4½
Double Rose Noble of K. James,	26½	9	0	0	0	8	21	6	16	27	23 3¼	1	13	0	1	25	3	4½	
Double Royal or Real,						8	2	3	3	29½	23 3¼	1	10	0	1	12	0	4½	
Double old Sovereign,	27½	8	18	8	5½ ¹⁰ ₁₄₇	8	0	0	0	30	22	0	1	6	8	1	8	5	4
Best double Sovereign of Hen. Edward 6. Elizabeth,	30	8	0	0	0	7	4	0	0	33½	22	0	1	3	10	1	5	5	4
Double Sovereign of K. Ja. called Unite or Jacobus,	36	6	16	0	0	6	10	16	18½ ¹⁰ ₁₄₇	37½	22	0	1	2	0	1	3	10	3
Laureat, or 20 s. Piece of James,	39½	6	1	9	2½ ¹⁰ ₁₄₇	5	20	9	18½ ¹⁰ ₁₄₇	41	22	0	1	0	0	1	1	4	3
Twenty Shil. piece of Charles I.	40	6	0	0	0	5	20	9	18½ ¹⁰ ₁₄₇	41	22	0	1	0	0	1	1	4	3
Old Rose Noble,	46½	5	3	4	4½ ¹⁰ ₁₄₇	5	0	0	0	48	23 3¼	0	18	2	0	19	4	2½	
Spurre Roy- { Henry 8. Edward 6. al of Phil. and Mary, Elizabeth,	48	5	0	0	0	4	23	0	0	48½	23 3¼	0	18	0	0	19	2	2½	
Spurre Royal of James,	52½	4	12	0	0	4	10	13	8	54	23 3¼	0	16	6	0	17	7	2½	
Double Noble of Elizabeth,						4	10	6	16	54½	23 3¼	0	16	0	0	17	1	2½	
Old Noble, or Noble of Hen. Rose Royal,	53½	4	11	3	6½ ¹⁰ ₁₄₇	4	10	0	0	54½	23 3¼	0	16	0	0	17	1	2½	
Old Sovereign,						4	1	1	13½	59½	23 3¼	0	15	0	0	16	0	2½	
Best Sovereign of Henry, Edward 6. Elizabeth,	54½	4	9	4	2½ ¹⁰ ₁₄₇	4	0	0	0	60	22	0	0	13	4	0	14	2	2
Sovereign of { Edward 6. Elizabeth,	60	4	0	0	0	3	14	0	0	66½	22	0	0	11	11	0	12	8	2
Old Ang. Noble, or Ang. of Hen. Last Angel Noble of Henry, Edward 6. Phil. and Mary, Elizabeth,	69	3	11	9	13½ ¹⁰ ₁₄₇	3	8	0	0	72	23 3¼	0	12	1	0	12	10	2	
	72	3	8	0	0	3	7	5	0	72½	23 3¼	0	11	11	0	12	8	2	
First Angel of James, Sovereign of K. James, cal- led Double-Britain Crown, George Noble,	72	3	0	0	0	3	5	8	9½ ¹⁰ ₁₄₇	74½	22	0	0	11	0	11	9	2	
Last Angel of James,						3	0	0	0	80	23 3¼	0	10	10	0	11	6	2	
Half Laureat of James,	80	3	0	0	0	2	23	2	5½	81	23 3¼	0	11	11	0	11	9	2	
Ten Shill. Piece of Charles I.	79½	3	0	14	13½ ¹⁰ ₁₄₇	2	22	4	21½	82	22	0	0	10	0	10	8	2	
Angel of Charles,	80	3	0	0	0	2	22	4	21½	82	22	0	0	10	0	10	8	2	
Half Spurre Royal,						2	16	14	9	89	23 3¼	0	10	0	10	8	2		
First Crown of King Henry,	97	2	12	0	0	2	11	10	0	96½	23 3¼	0	9	0	9	7	2		
Single Noble of Elizabeth,	100½	2	9	6	6½ ¹⁰ ₁₄₇	2	9	0	0	101½	22	+	0	8	0	8	5	2	
Half old Noble,						2	5	3	8	108½	23 2½	0	8	0	8	6	2		
Salute,	107½	2	5	11	15½ ¹⁰ ₁₄₇	2	5	0	0	108½	23 3¼	0	8	0	8	6	2		
	108	2	5	6	16	2	5	0	0	108½	23 3¼	0	7	10	5	8	2		

Names of the Pieces.	Pieces to the	Weight by the Malines, &c.				Common Weight				Pieces to the		Fine		Value, 1640.		Value, 1660.		17
	lb. Tr.	pwt.	gr.	m. dr.	pwt.	gr.	m. gr.	lb. Tr.	Car.	gr. l.	s.	d. l.	s.	d. gr.				
Base Crown of K. Henry, called Rose Crown,	120	2	0	0	0	1	23	0	0	122 $\frac{3}{4}$	20	0	5	11	0	6	4	1
Crown of {Edward 6. Elizabeth	120	2	0	0	0	1	19	0	0	133 $\frac{3}{4}$	22	0	5	11	0	6	4	1
Half Angle Noble of Henry, Half last Angel of Henry,	138	1	17	14	18 $\frac{3}{4}$	1	16	0	0	144	23	3 $\frac{1}{2}$	6	0	0	6	5	1
Half An- {Edward 6. gel of {Phil. and Mary, Elizabeth.	144	1	16	0	0	1	15	12	12	145 $\frac{1}{2}$	23	3 $\frac{1}{2}$	5	11	0	6	4	1
Half first Angel of James,																		
Britain Crown of James, Half George Noble,	144	1	16	0	0	1	14	14	4 $\frac{3}{4}$	148 $\frac{1}{2}$	22	0	5	6	0	5	10	1
Half last Angel of James, New Crown of James,	160	1	12	0	0	1	11	11	2 $\frac{1}{2}$	192	23	3 $\frac{1}{2}$	5	6	0	5	10	1
Crown of Charles I.	158 $\frac{3}{4}$	1	12	7	6 $\frac{1}{4}$	1	11	2	10 $\frac{3}{4}$	164	22	0	5	0	0	5	4	1
Two Parts of Salute, Half Henry first Crown,	160	1	12	0	0	1	11	2	10 $\frac{3}{4}$	164	22	0	5	0	0	5	4	1
Half Salute, Half Rose Crown,	162	1	11	11	2 $\frac{3}{4}$	1	11	0	0	194 $\frac{1}{4}$	23	3	5	0	0	5	7	1
Half Crown of {Edward 6. Elizabeth,	201	1	4	13	3 $\frac{1}{4}$	1	4	10	0	202 $\frac{3}{4}$	22	1	4	0	0	4	2	1
Quarter old Angel Noble, Quarter last Angel of Henry,	216	1	2	13	8	1	2	10	0	217 $\frac{1}{2}$	23	3	3	11	0	4	2	1
Quarter An- {Edward 6. gel of {Phil. & Mary, Elizabeth,	240	1	0	0	0	0	23	10	0	245 $\frac{1}{4}$	20	0	2	11	0	3	2	$\frac{1}{2}$
Quarter first Angel of James, Half Britain Crown of James, Quarter last Angel of James,	240	1	0	0	0	0	21	10	0	267 $\frac{3}{4}$	22	0	2	11	0	3	2	$\frac{1}{2}$
	276	0	20	17	9 $\frac{3}{4}$	0	20	0	0	288	23	3 $\frac{1}{2}$	3	0	0	3	2	$\frac{1}{2}$
	288	0	20	0	0	0	19	16	6	290 $\frac{3}{4}$	23	3 $\frac{1}{2}$	2	11	0	3	2	$\frac{1}{2}$
	288	0	20	0	0	0	12	7	2 $\frac{1}{4}$	297 $\frac{1}{2}$	22	0	2	9	0	2	11	
							0	17	15	13 $\frac{3}{4}$	324	23	3 $\frac{1}{2}$	2	9	0	2	11

COITION, is a Word sometimes used for that mutual Attraction or Tendency towards each other, which is found between Iron and the Magnet.

COLATURE, is that, which after boiling or infusion of any Ingredients, is percolated or strained through a Sieve or Cloth; or through Hippocrates's Sleeve, as the Chymists speak.

COLCOTHAR, is the dry Substance red as Blood which remains after Distillation of Vitriol, commonly called *Caput Mortuum*; though when Vitriol is calcined a good while in a strong Fire, it will turn red, and is also called *Colcothar*.

COLD, is one of those Qualities of Bodies which they call *Primary*, and is nothing but the arriving of the minute and insensible Parts of any Body at such a State, as that they are more slowly or faintly agitated than those of our Fingers or other Organs of Feeling; for from this Effect we pronounce any Body to be cold.

Mr. Hobbs thought the Cause of Cold to be only a Wind taking the condensed or frozen Body.

Whether Cold be barely a Privation of Heat, or rather a stop put to that violent tumultuary Motion of the insensible Particles of Bodies, as the Cartesians assert; or whether Cold be introduced by the Entrance of adventitious Particles actually cold themselves, and therefore called *Frigorifick Particles*, according to the Opinion of the Learned and Ingenious Gassendus, is a Controversy not so easy to be determined as at first Sight it may appear. For though the considerable Encrease of the Dimensions of the same Quantity of Water when turned into Ice, and the prodigious Force of Freezing, by which Water may be made to lift up vast Weights, and to break to Pieces some of the strongest Bodies that are; and also since it is true, that a brisk, nay a furious Agitation of the small Parts of a

Mixture may be produced, and yet on the Con-
flict the Mixture shall become not only not Hot, but sensibly and considerably Cold; though, I say, these seem to bid very fair for a Proof of Gassendus's Opinion; yet, on the other Hand, 'tis certain, that a bare Privation of Motion will produce, or rather occasion, Effects as considerable as any of those of Cold, as the Excellent Mr. Boyle largely shews in his Dialogue about the Positive or Privative Nature of Cold: And also, if it should be ask'd how the Frigorifick Particles themselves become cold? What degree of Gravity or Levity they have? What kind of Structure in them is proper to produce such an Effect? Whether such a Structure be destructible or mutable, or not? Whether these Frigorifick Particles be primitive Bodies or not? And whether there was not Cold in the World till they were produced; If these or such like Queries were made about the Nature and Circumstances of the Frigorifick Particles, it would, I believe, puzzle the Maintainers of the Opinion of Gassendus to give satisfactory Answers to them and therefore the Decision of this Point must be suspended further.

Mr. Boyle found, that though Water usually expands it self in Freezing, yet 'tis always first contracted or condensed; and that Spirit of Wine, common exprest Oils, and Chymical Oil of Anniseeds it self, will be notably condensed when exposed to an intense Degree of Cold. And he found that no other Liquor but Water, or one in which there are store of Watry Particles, will ever be expanded by Cold. The Reason of which perhaps may be, that Water contains more Air in its Pores than other Fluids; and 'tis not improbable, that from the Coalescence of many of the Aereal Particles into one during the Action of Freezing

Freezing, their Spring may by that Means be encreased, and so they may from those numerous and large Bubbles we observe in Ice, which occasions it to be specifically lighter than Water.

The Expansion of Water in Freezing is about $\frac{1}{10}$ Part of the Space more than it before took up.

The *Expansive Force of Cold* is so great, that if the Barrel of a Gun be filled with Water, and then have its Muzzle and Touch-hole well stop'd, the Water within the Barrel, when either by Natural Cold or a Freezing Mixture it is turned into Ice, will break the Barrel in several Places, as Mr. Boyle and many others have tried.

That noble Philosopher contriv'd several Experiments to estimate or measure the Quantity of this *Expansive Force*, which were made with a Brass Cylinder of two or three Inches in Diameter, into whose Cavity was put a Bladder filled with Water, and strongly tyed about the Neck, and over it was put a Wooden Plug, to stop up the upper Orifice of the Cylinder; and on the Plug was put a broad flat Board, on which was laid as much Weight as one time amounted to above an Hundred Pound, another time an Hundred and Twenty Pounds, and another time to two Hundred fifty four Pounds; and yet in all the Experiments, when the Water in the Bladder was turned into Ice, it expanded so as to raise up all this Weight very conspicuously, as appeared by a Circle designedly made on the Wooden Plug.

He tells us also, That by mingling together three Saline Bodies, each of them purified by the Fire, tho' there did arise a very great Commotion, Hissing and Explosion, yet a very considerable Degree of Cold was thereby produced: And tho' he was under an Obligation of not discovering what these Ingredients were, yet he gives a *Succedaneum* to that Experiment, by telling us, that by putting good Salt of Tarter into Spirit of Vinegar, there was a Struggle, Commotion and Hissing produced, and yet instead of Heat, as is usual in such Cases, a very sensible Degree of Cold was produced.

Sylivious also acquaints us with a Method of producing Cold, by mingling Spirit of Virriol with another Saline Spirit.

If in 3 or 4 times its weight of Water, you put about half a pound of *Sal Almoniac* powdered, and stir it about to hasten the Dissolution, so great a Degree of Cold will, even in the Heat of Summer be produced, as is very surprizing; for if you nimbly shake it, or stir it about, it will produce actual Ice on the outside of the Glafs, if you purposely wet it with Water. This Noble Experiment Mr. Boyle first made, and thereby plainly proved the Mechanical Producibleness of the Quality of Cold; and the Experiment may be of great Use to cool Wine, &c. in the hot Months, or in such Places where no good Cellarage is to be had. The *Sal Armoniac*, by evaporating the Water from it, may be recovered again, and will serve many times for the same Experiment.

That Honourable Virtuoso found also, that by shaking Gunpowder in 4 or 5 times its Weight of common Water, a considerable sensible Coldness would be produced.

The Learned Dr. *Stare* produces a considerable Experiment (in *Philos. Trans. N. 150.*) whereby a considerable Degree of Cold is made with a very great Ebullition, as in the former Experiment it

is produced without any. The Experiment is only to pour into any strong Acid (he used mostly Spirit of Verdigrease) a Quantity of the Volatile Spirit of Human Blood; by which Means he tells us, that he produced so much Cold, as that the Spirit of Wine in an immersed Thermoscope, descended within half an Inch of the Freezing Point even in Summer. And this he thinks, very ingeniously, may serve to Explain the Phænomenon of the Cold fits in Agues.

And since, if into this Mixture he poured a small Quantity of Oil of Sulphur, the Matter would immediately grow sensibly Warm, he not improbably suggests, that something like this may occasion the coming of the Hot-fit afterwards, when the Animal Spirits come to be mixed with the Blood more copiously, than at first in an Ague Fit they can be.

Neither our *Senses* nor common *Weather-Glasses*, can enable us to make an accurate Judgment of the Degree of Cold.

For as to our *Senses*, the Organs of Feeling are in a continual State of Mutability, and that (in general) appears Cold to us, which hath its Parts less moved than those of our Hands or Bodies; and therefore if one Hand be very Cold, and the other moderately Warm, the same Water, for instance, will appear Warm to the Cold, and Cold to the Warm Hand.

As to *Common Weather-Glasses*, some Part of the Liquor being contiguous to the open Air, the Weight and Pressure of the Atmosphere hath so great an Effect on them, that their rising and falling depends more on that than on Heat and Cold, and therefore they will often mis-inform us,

The Coldness of Places doth not solely nor principally depend on their nearness to the Poles.

For *Martinus*, in his *Atlas Chinesis*, saith, that in *China*, whose Latitude is no where above 42 Degrees, the Rivers for four Months together (*viz.* from the Middle of November till the Beginning of March) are so Frozen up, that laden Waggon do safely pass on the Ice; and that the Ships and Vessels are all Frozen up; and what is most remarkable, is, the Frost is usually the Result but of one Day's time, though it require many to thaw it again.

A Dutch Master of a Ship, that went within a Degree of the Pole, found the Sea open, and the Weather tolerable enough.

COLDNESS Potential: See *Potential Coldness*.

COLICK, is a Vehement Pain in the Abdomen or lower Belly, and takes its Name from the Part chiefly affected, *viz.* the Gut Colon, which is stretch'd, prick'd and corroded by Winds or Excrementitious Humours, either remaining within its Cavity, or fix'd to its very Coat.

COLLAR of a Ship, is a Rope fastned about her Beak-head, unto which the Dead-man's Eye is seized that holds her Main Stay. There is also a *Collar* or *Garland* about the Main-Mast Head, which is a Rope wound about there to save the Shrouds from galling.

COLLATERAL Assurance, is a Bond that is made over and beside the Deed it self, for the performance of Covenants between Man and Man.

COLLATION, in a Logical Sense, is the same as a comparing of one thing well with another; but now-a-days 'tis used for an Handsome Treat or Entertainment.

COLLATIONE *facta uni post mortem alterius*, is a Writ directed to the Justices of the *Common-Pleas*, commanding them to direct their Writ to a Bishop, for the admitting a Clerk in the Place of another presented by the King, who during the Suit between the King and the Bishop's Clerk, is departed this Life. For Judgment once pass'd for the King's Clerk, and he dying before admittance, the King may bestow his Presentation to another.

COLLATIONE *Heremiticæ*, is a Writ whereby the King conferreth the keeping of an *Hermitage* upon a Clerk.

COLLICIE, are the joining of the *Puncta Lachrymalia* into one Passage on both Sides, which derive the Humour of the Eye-lids into the Cavity of the Nostrils; the Holes that are made in the very Tops of the Eye-brows descend in little Channels, they spread themselves into a larger Channel, and are continued to the Tunick of the Nostrils. The same Holes or Openings in Hares, Calves, Rabbits, are not found in the very Eye-brows, but a little more Inward; and most of all in Birds, where they are larger than in any other Creatures; the *Membrane* which separates the Holes here is very short. *Blanchard.*

COLLIQUANS *Febris*, is one of the Nature of ordinary burning *Fevers*, but by its excessive Heat they say it suddenly melts the Fat, Flesh and Substance of the solid Parts of the Patient's Body; nay sometimes dissolves the very Blood in the *Veins*, as some tell you, and dischargeth the same by insensible Transpiration, as Sweat, Urine, or Stool, &c.

COLLIQUATION, or *melting of Metals*: Thus we say, Silver and Lead being melted or Colliquated together over a strong Fire, will mingle *per minima*, that is, unite thoroughly together.

COLLISION, is the striking of one hard Body against another.

COLLUSION, in Common-Law, is a deceitful Argument or Compact between two or more, for the one Party to bring an Action against another for some evil Purpose, as to defraud a Third Person of his Right, &c.

COLLUTIO, is a washing of the Mouth; as when 'tis done to clean or fasten bad or loose Teeth, or free the Gums from Ulcers, &c.

COLLYRIUM, is an oblong or round *Tablet* or *Trochisk*, used formerly in Distempers of the Eyes, and was then called by the *Arabian* Name of *Seif* or *Sief*. It was dissolved in a convenient *Vehicle*, that it might conveniently be applied; and from hence any Medicines, in a Liquid Form, designed to cure Diseases in the Eyes, are called *Collyrium*.

COLOBOMA, is the growing together of either Lips or Eye-lids, or the adhering of the Ears to the Head preternaturally, &c.

COLON, is the second of the great Guts, arising from the *Cæcum Intestinum* in the Right Flank, and adheres to the Right Kidney; thence it tends up unto the Liver, and sometimes is annexed to the Gall-Bladder, which dies it of a Yellowish Clay-colour; thence it goes on transversely under the Bottom of the Stomach, and on the Left Hand is fastned to the Spleen; after which it is fastned to the Left Kidney, winding and turning very obliquely there, but afterwards it descends almost in a Right Line. It is the widest and largest of all the Guts, and is usually about 8 or 9 Hands

Breadths long; it abounds with small Cells, or little Cavities every where: It hath a Valve to hinder any thing from returning from the great Guts into the small.

COLON, is a Point in Grammar mark'd thus, (:) and shews a Sentence to be perfect or entire, but yet the Sense depending or continuing on; as in this of *Seneca*, *Ante omnia necesse est, seipsum estimare: Quia fere plus nobis videtur posse, quam possumus.*

COLOUR, may be considered two ways. 1. As it is a Quality residing in the Body that is said to be so and so coloured, or which doth modify the Light after such and such a manner: Or, 2. As more properly the Light it self, which so modified strikes upon the Organ of Sight, and produces that Sensation which we call Colour.

The *Peripateticks* asserit *Colours* to be real Qualities, and inherent in the coloured Bodies, and suppose that Light doth only discover them, but not any way Effect their Production.

Plato thought Colour to be a kind of Flame consisting of most minute Particles, very congruous to the Pores of the Eye, and darted against it from the Object. And some Moderns will have Colour to be a kind of internal Light of the more lucid Parts of the Object darkened, and consequently altered by the various Mixtures of the less Luminous Parts.

Others, as did some of the ancient Atomists, maintain Colour not to be a lucid Stream, but a Corporeal Effluvium issuing out of the coloured Body.

Others account for all Colours out of the various Mixture of Light and Darknes: and the Chymists sometimes will have it arise from the Sulphur, and sometimes from the Salt that is in Bodies; and some also from the third Hypostatick Principle, *Mercury*.

The *Cartesians*, who make the Sensation of Light to be the Impulse made on the Eye by certain solid, but very minute Globules, easily permeating the Pores of the Air and Diaphanous Bodies: These, I say, derive Colour from the various Proportion of the direct Progress or Motion of these Globules, to their Circumrotation or Motion round their own Centres; by which Means they are qualified to strike the Optick Nerve after distinct and divers Manners, and so do produce the Perception of various Colours.

Dr. Hook, in his *Micrographia* says, The Phantasm of Colour is caused by the Sensation of the oblique or uneven Pulse of Light; and that this is capable of no more Varieties than two, which arise from the two Sides of the oblique Pulse; so that there is in reality but two simple Colours, Yellow and Blue; from the Mixture of which, and a due Proportion of Black and White (that is, Darknes and Light) all Colours may be produced.

The incomparable *Sir Is. Newton* found by two Experiments on Prisms, that there is a great Difformity in the Rays of Light, and that hereby the Origin of Colours may be unfolded. The Doctrine therefore of Colours, according to his Notion and Experiments, are contained in the following Propositions.

1. As the Rays of Light differ in degrees of Refrangibility, so they also differ in their Disposition to exhibit this or that particular Colour.

Colours are not *Qualifications* of Light, derived from Refractions or Reflections of Natural Bodies (as 'tis generally believed) but *Original* and *Connate Properties*, which in divers Rays are divers. Some Rays are disposed to exhibit a red Colour, and no other; some a Yellow, and no other; some a Green, and no other; and so of the rest. Nor are there only Rays proper and particular to the more eminent Colours, but even to all their intermediate Gradations.

2. To the same Degree of Refrangibility, ever belongs the same Colour, and to the same Colour ever belongs the same Degree of Refrangibility. The *least Refrangible Rays* are all disposed to exhibit a Red Colour, and contrarily those Rays which are disposed to exhibit a Red Colour, are all the *least Refrangible*; so the *most Refrangible Rays* are all disposed to exhibit a deep Violet Colour; and contrarily, those that are apt to exhibit such a Violet Colour, are all the *most Refrangible*: And so all the intermediate Colours in a continued Series belong to intermediate Degrees of Refrangibility. And this Analogy 'twixt Colours and Refrangibility, is very precise and strict; the Rays always either exactly agreeing in both, or proportionably disagreeing in both.

3. The Species of Colour, and Degree of Refrangibility proper to any particular sort of Rays is not mutable by Refraction, nor by Reflection from Natural Bodies, nor any other Cause that could be yet observed when any one sort of Rays hath been well parted from those of other kinds, it afterwards obstinately retained its Colour, notwithstanding all Endeavours to change it. Though refracted with Prisms, and reflected with Bodies, which in Day-light were of other Colours; having also intercepted it with the coloured Film of Air interceding two compressed Plates of Glass; transmitting it thro' other coloured Mediums, and thro' Mediums irradiated with other sorts of Rays, and diversly terminated it, and yet could never produce any new Colour out of it. It would by contracting or dilating become more brisk or faint, and by the loss of many Rays, in some Cases, very obscure and dark; but could never be seen to change in *specie*.

4. Yet seeming Transmutation of Colours may be made where there is any Mixture of divers sorts of Rays; for in such Mixtures the *Component Colours* appear not, but by their mutual alloying each other, constitute a middling Colour; and therefore, if by Refraction, or any other of the *aforesaid Causes*, the difform Rays, latent in such a Mixture, be separated, there shall emerge Colours different from the Colour of the Composition: Which Colours are not new generated, but only made apparant by being parted; for if they be again entirely mix'd and blended together, they will again compose that Colour which they did before separation. And for the same Reason Transmutation made by the conveneing of divers Colours are not real; for when the difform Rays are again severed, they will exhibit the very same Colours which they did before they entered the Composition; as you see Blue and Yellow Powders, when finely mix'd, appear to the naked Eye Green; and yet the Colours of the component Corpuscles are not thereby really transmuted, but only blended, for when view'd with a good Microscope, they still appear Blue and Yellow interspersedly.

5. There are therefore two sorts of Colours, the one Original and Simple, the other compounded

of these. The Original and Primary Colours are Red, Yellow, Green, Blue, and a Violet Purple, together with Orange, Indico, and an indefinite variety of intermediate Gradations.

6. The same Colours in *Specie* with these Primary ones may be also produced by Composition; for a mixture of Yellow and Blue makes Green; of Red and Yellow makes Orange; of Orange and Yellowish Green makes Yellow: And in general, if any two Colours be mixed, which in the Series of those generated by the Prism, are not too far distant one from another, they, by their mutual alloy, compound that Colour which in the said Series appeareth in the Mid-way between them; but those which are situated at too great a distance, do not so, Orange and Indico produce not the intermediate Green, nor Scarlet and Green the intermediate Yellow.

7. But the most surprizing and wonderful Composition was that of *Whiteness*. There is no one sort of Rays alone which can exhibit this: 'Tis ever compounded, and to its Composition are requisite all the *aforesaid Primary Colours* mixed in a due Proportion; for all the Colours of the Prism being made to converge, and thereby to be again mixed as they were in the Light before it was incident upon the Prism, will produce Light intirely and perfectly White, and not at all sensibly differing from a *direct Light of the Sun*, unless when the Glasses are not sufficiently clear.

8. Hence therefore it comes to pass, that *Whiteness* is the usual Colour of Light; for Light is a confused aggregate of Rays indued with all sorts of Colours, as they are promiscuously darted from the various Parts of Luminous Bodies. And of such a confused Aggregate is generated *Whiteness*, if there be a due Proportion of the Ingredients; but if any one predominate, the Light must incline to that Colour, as it happens in the Blue Flame of Brimstone; the Yellow Flame of a Candle; and the various Colours of the fixed Stars.

9. These things considered, the Manner how Colours are produced by the Prism is evident: For the Rays constituting the incident Light, since those that differ in Colour proportionably differ in Refrangibility, they, by their unequal Refractions, must be severed and dispersed into an oblong Form, in an orderly Succession from the least refracted Scarlet to the most refracted Violet. And for the same Reason it is, that Objects, when look'd upon through a Prism, appear coloured: For the difform Rays, by their unequal Refractions, are made to diverge towards several Parts of the Retina, and there express the Images of things coloured, as they do the Sun's Image upon a Wall. And by this Inequality of Refractions they become not only coloured, but also very confused and indistinct.

10. Why the Colours of the Rainbow appear in falling drops of Rain, is also from hence evident; for those drops which refract the Rays disposed to appear Purple in greatest quantity to the Spectator's Eye, refract the Rays of other sorts so much less, as to make them pass beside it; and such are the Drops on the Inside of the Primary Bow, and on the Outside of the Secondary or exterior one: So these Drops which refract in greatest Plenty the Rays, apt to appear Red towards the Spectator's Eye, reflect those of other sorts so much more as to make them pass beside it; and such are the Drops on the Exterior Part of the Primary, and Interior Part of the Secondary Bow.

11. The odd Phænomenon of an Infusion of *Lignum Nephriticum*, *Leaf-Gold*, *Fragments of Coloured Glass*, and some other transparently Coloured Bodies appearing in one Position of one Colour, and of another in another, are on these Grounds no longer Riddles; for those are Substances apt to reflect one sort of Light, and transmit another, as may be seen in a dark Room, by illuminating them with similar or uncompounded Light: For then they appear of that Colour only with which they are illuminated, but yet in one Position more vivid and luminous than in another, accordingly as they are disposed more or less to reflect to transmit the incident Colour.

12. From whence also is manifest the Reason of an unexpected Experiment, which Dr. *Hook* in his *Micrography* relates to have made with two Wedge-like transparent Vessels, filled the one with a Red, the other with a Blew Liquor; namely, that tho' they were severally transparent enough, yet both together became opaque; for if one transmitted only Red, and the other only Blue, no Rays could pass through both.

13. That the Colours of all natural Bodies have no other Origin than this, that they are variously qualified to reflect one sort of Light in greater plenty than another. And this was experimented in a dark Room, by illuminating those Bodies with uncompounded Light of divers Colours; for by that means any Body may be made to appear of any Colour: They have there no appropriate Colour, but ever appear of the Colour of the Light cast upon them, but yet with this Difference, that they are more brisk and vivid in the Light of their own Day-light Colour. *Minium* appeareth there of any Colour indifferently with which 'tis illustrated, but yet most luminous in Red; and so *Bise* appeareth indifferently of any Colour with which 'tis illustrated, but yet most luminous in Blue; and therefore *Minium* reflecteth Rays of any Colour, but most copiously those indeed with Red; and consequently, when illustrated with Day-light, that is, with all sorts of Rays promiscuously blended, those qualified with Red shall abound most in the reflected Light, and by their Prevalence cause it to appear of that Colour: And for the same Reason *Bise* reflecting Blue most copiously, shall appear Blue by the excess of those Rays in its reflected Light; and the like of other Bodies. And that this is the entire and adequate Cause of their Colours is manifest, because they have no Power to change or alter in the Colours of any sort of Rays incident apart, but put on all Colours indifferently with which they are enlightened.

These things being so, it can be no longer disputed, whether there be Colours in the Dark? Nor whether they be the Qualities of the Objects we see? nor, perhaps, whether Light be a Body? For since Colours are the Qualities of Light, having its Rays for their entire and immediate Subject, how can we think those Rays Qualities also, unless one Quality may be the Subject of and sustain another, which in effect is to call it Substance? We should not know Bodies from Substances, were it not for their sensible Qualities; and the Principal of those being now found due to something else, we have as good Reason to believe that to be a Substance also.

Thus far went this wonderful Man, as long since as the Year 1675, as you may see more at large in

the *Philosoph. Transact. N.* And as himself acquaints us (with his usual Modesty) in his excellent Treatise of *Opticks* just now published, and come to my Hands while this Part is composing at the Press, where the Reader will meet with ample Satisfaction as to all Parts of the admirable Doctrine of Light and Colours. And that the World may see that the Account he so long ago Published of this Theory was both intelligible and certainly true, I have subjoined the subsequent Experiments which came to my Hands a Year ago, and are inserted here also at the desire of their Author, the ingenious Mr. *John Perks* of Old Swinford in *Worcestershire*.

An Abstract of Sir *Is. Newton's* Doctrine concerning Light and Colours.

1. Light consists of an infinite number of Rays Right-lined and Parallel, but of different Degrees of Refrangibility when meeting with a different Medium.

2. Each Ray according to its degree of Refrangibility, when so refracted, appears to the Eye of a different Colour.

3. The least Refrangible Rays appear of a deep Scarlet, the most Refrangible appear of a Violent Blue, the intermediate proceeding from Scarlet to Yellowish, than to light Green, and so to Blue.

4. The Colours arising from the different Refrangibility of Light, are not only the more noted Colours of Red, Yellow, Green, Blue, but also all the intermediate Degrees of Red to Yellow, of Yellow to Green, &c. differing as the Degrees of sound from Grave to Acute, in which there are not only the Notes of common Denomination, but also indefinite intermediate Degrees of Sounds, which are distinct different Sounds as the other.

5. Whiteness (such as the Sun's Light appears) containing all these Degrees of Refrangibility, is consequently made up of all the above-mentioned Colours.

6. Simple or Homogeneous Colours are such as are produced by Homogeneous Lights or Rays, that have the same Degree of Refrangibility, and mix'd Colours are such as are produced by Rays of different Refrangibility.

7. Rays of the same Refrangibility produce the same Colour, which Colour is not alterable by repeated Refractions, only made more strong or faint as the Rays are united or scattered.

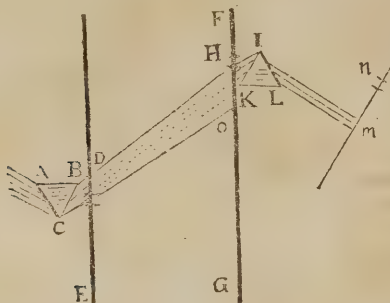
8. All Bodies appear of this or that Colour according as the Surfaces are adapted to reflect only the Rays of such a Colour, or (at least) in more plenty than the rest.

Experiments for Confirmation of the foregoing Doctrine.

Experiment I.

The great Experiment on which Sir *Is. Newton* grounds his Doctrine (and which he calls *Experimentum Crucis*) is after this manner; *BE* and *FG* are two Boards about 4 or 5 Yards distance, having in each of them a little round Hole at *D* and *H*, about $\frac{1}{4}$ of an Inch Diameter; *ABC* is a Prism exposed to the Sun, *IKL* is another Prism, whose Side *IK* is near parallel to the Side *BC* of the other, and receiving the Rays *DH*, refracts them to fall on a Paper *nm*.

The Colours will fall from *H* to *O* on the Board *FG*: Let one only Colour (suppose Blue) fall on the Hole *H*, and it will be refracted by the Prism



IKL to fall (suppose) at *M*; then move the Glas *ABC* about its Ax, so as to bring another Colour (suppose the Red at *O*) to the Hole *H*, and it will by the Glas *IKL* be refracted not to *M*, but another Place (suppose *N*) some distance from the other, and in like manner will each Colour be refracted to fall on a different Place, tho' the Glas *IKL* be held unmoved. This Experiment proves the different Refrangibility of the Rays of Light, and that different Colours do thence arise.

For the Holes *D* and *H* being fix'd, and also the Glas *IKL*, 'tis plain, that the Rays have a like Incidence on the Glas *IKL*, but the different Places where they fall on the Paper, as *M*, *N*, &c. shew a different Refraction in the Glas *IKL*; and the Eye discovers a different Colour, according to the different Places on which the Rays fall, which demonstrates the fundamental Doctrine of the Theory.

Sir *I. Newton* directs this to be done in a dark Room, where (no doubt) all will appear more exact and lively. My Trial (for want of Conveniences) was in an open Room, but it succeeded well enough to satisfy me of the Truth.

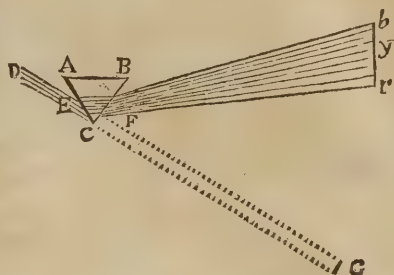
He observes, that the Oblong Image of Colours *HO* will be about 5 times its Breadth, which also shews the different Refrangibility of the Rays, which otherwise would be near round as the Hole *D* is.

Experiment II.

Being in a convenient Room, where the Sun shines thro' a Hole or open Casement, turn your Back towards the Sun, and hold the one End of the Prism so to your Eye, that the Sun may shine on the other End; then move it so about its Ax, that the Colours may appear somewhere on the Wall; find the Colours with your Eye looking thro' the other End of the Glas, and there will appear a Spot of perfect Light.

The Reason of this Appearance is this; The parallel Rays *DE* meeting with the Glas at *E*, and again with the Air at *F*, are separated by these two Refractions, the least Refrangible appear Red at *r*, and the most Refrangible appear Blue at *b*, with the intermediate Colours between. These Colours being view'd by the Eye at *E*, the Rays come back (near) the same way they went, and are therefore in like manner united at the Eye, as they were in their Incidence from the Sun, and consequently

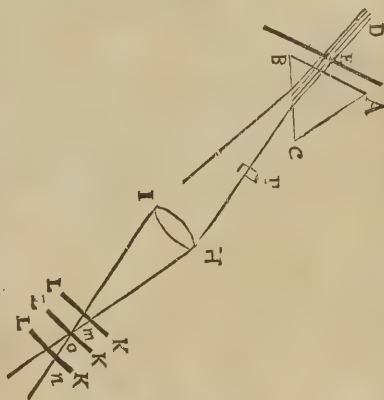
have the same Appearance (White) as the Light itself. The Place where the Spot of Light appears to the Eye is at *G*, where the Rays would have



fallen had they not been intercepted, and of a Bigness according to what Light falls on the Glas, whereas the Coloured Image *b y r* will appear four or five times longer, by reason of the scattering of the differently refracted Ray.

Experiment III.

ABC is the Prism, upon one of whose Sides is put a Past-board or thick Paper *AB*, or the like, with a little round Hole at *E*, which being exposed to the Sun's Rays *DE*, they are refracted and carried (in Colours) towards *HL*.



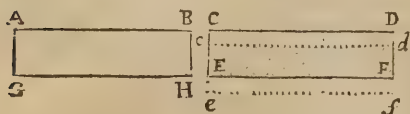
HI is a Lens (or a common Magnifying Glas) broad enough to receive all the coloured Rays; where they being made to converge by the Glas, they will be united in *O*, the Focus of the Glas.

Hold a Piece of Paper *KL* in the Focus, where all the Colours are united, and the little Spot at *O* will be perfect Light or Whiteness: But if the Paper *KL* be held farther or nearer off (as at *M* or *N*) the Colours will appear. If any Colours be intercepted, as at *P*, the Light near *O* will not be clear White, but inclining to the remaining Colours. If the Blue be wanting, the White will be somewhat Reddish or Flesh-colour, and if the Red be wanting, the White will incline to be something Bluish: And if only one Colour be let come to the Lens, that Colour, without Alteration, will be transferr'd to the Paper *KL*.

This Experiment shews, (1.) That all the Colours being united make Light or Whiteness. (2.) That if any Original Colour be wanting, the White will not be pure. (3.) That a Simple Colour is not alterable by farther Refractions, which also will appear if another Prism be put at O.

Experiment IV.

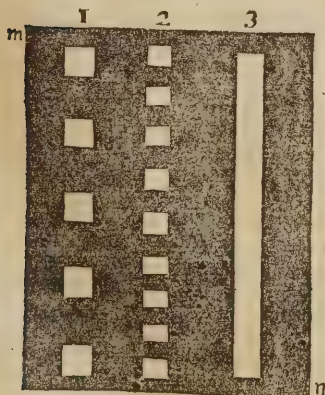
Let $ABGH$ be a Piece of fine Silk of a lively Scarlet Colour, whose Edges AB and GH are freight, parallel and smooth; let $CDEF$ be a



another Piece of Violet Blue Silk, like and equal to the other. Let them be placed, as in the Figure, on some black Cloth or Door, with their Edges in a straight Line: View them through a Prism at about two or three Yards distance: The Ax of the Prism being Parallel to the Position of the Silks: So will the blue Piece CF appear lower than the other (*viz.*) as in $cdef$. The Reason of which appearance is, that Blue is more Refrangible than Red.

This will more fully appear, if instead of the Blue Silk CF , there be let fall in the Place of CF , the Blue Rays from another Prism (the other Colours being intercepted by a Paper with a Square Hole for the Blue to pass through.) If the Silk AB and the blue Square CF be view'd thro' a Prism (as before) the Blue will appear far below, as at KL , this being a more perfect Blue than any Silk can be of.

Experiment V.



Let MN be the black Cover of a Book, Paper coloured Black, or the like; upon which lay in a

freight Line five or six little Squares of White Paper, about the Bigness and at the Distance as in the Figure, first Column: View these through a Prism, so as that the Row of little Squares have its one End towards you, or be in a Plain perpendicular to the Ax of the Prism, and about two Foot distance from the Glass; so will you see a Stream of Colours proceeding from every Square towards the next nearer you, the Colours arising out of each white Square. Move these Squares near to one another, or put others between them, as in the second Column (still keeping them in a straight Line) and you will see as they come near, that the Colours mixing one with another will alter, approaching nearer to White till the Squares touch, and then all the Colours being perfectly mix'd they produce Whiteness, and appear as in the third Column, a white Line, only tag'd with Red at the Top and Blue at the Bottom, there being no other Colours coming from above to mix with the uppermost Red, nor any Colours below the Blue at Bottom for it to mix with. If you turn the Paper MN aside a little from its Perpendicularity to the Glass, the third Column, which before appeared White, will all appear in Colours arising out of the White, and Streaming towards you, being always in a Plain Perpendicular to the Axis of the Prism.

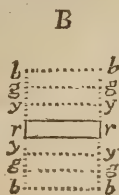
From this Experiment and the foregoing Doctrine we have the Reason why a Sheet of white Paper, or the like, appears coloured only at the Edges, for there only the Colours want others to mix with them: In the Middle, taking any Point the several Colours from so many other Points meet there as make White. For Instance,

Let rr be any little Particle in the Middle of the white Surface, whose other Colours streaming towards B , leave the Particle rr itself Red, as the Squares will do in the last Experiment. The Yellow of the Particle yy , the Green of the Particle gg , the Blue of the Particle bb do all meet on the Particle rr , which is Red.

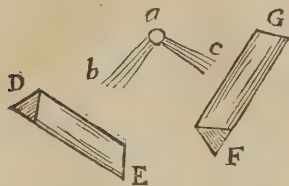
(For if bb were a white Particle, and all black about it, its blue Colour would be seen upon rr ; and if gg were another, its Blue would be below rr , and its Green upon it, &c.) and so there being a Concurrence of all the Colours that make up White, it consequently appears White. The same is to be said of any other Particle lying so far from the Edges as to have other Particles between to transmit their Colours.

If a Square Paper be held so straight before you that the two Side Edges be in a plain Perpendicular to the Axis of the Glass, they will be White, and no Colours appear but at the Top and Bottom, the Streaming of the Colours being in such a perpendicular Plain, as may be observed by looking at any white Spot through the Glass, and then turning it a little obliquely to the Horizon, or one End higher than the other.

So in the Position of the Glass DE (see the following Fig.) the white spot ascends its Colours towards b , and in the Position FG the Colours stream from a to c . If a black Spot, as A , upon a Paper be view'd through the Prism, the Top will have Green and Blue upon it, and under the lower Part will appear Red and Yellow;



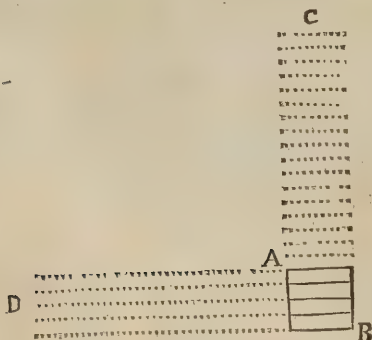
the Reason of which is, that the Blue comes from the White above it, and appears on the



Black, there being no other Colours to mix with it: The Red appears under the Spot, because the black Spot transmits no other Colours to mix with the Red.

Experiment IV.

Hold the Prism so to the Sun, as that thee Colours may appear upon a large plain Wall, as at *AB*; turn the Prism swiftly about it Axis, so as that the Colours may move swiftly up and down, as from *B* to *C*.



So will there appear no Colour distinct, but a faint white Streak between *B* and *C*, which so appears, because by the swiftness of the Motion the several Colours are confounded and mixed, and therefore appear White. Then move the Glass in such manner, that the Colours may move sideways and swiftly from *B* to *D*, in which Case the Colours will not disappear, but make a sort of List of several Colours, because they are not mix'd to make Whiteness, but each Colour keep in its own Line.

Experiment VII.

In a dark Room, having a little Hole for the Sun's Rays to come in, apply the Prism to the Hole, so as that the Colours may appear on a Wall. Hold a Quantity of Smalt, or Powder-Blue, or blue Silk in the Colour severally, and it will appear clear of the Colour of the Rays that fall on it, (*viz.*) Red while the Red Light falls upon it, and Yellow when the Yellow Light falls on it:

but of all the Colours 'twill most strongly reflect the Blue, the Surface being most disposed to reflect those Rays, &c.

Then view a Quantity of Vermilion, or a little Piece of Scarlet Silk in the Blue Light, and 'twill appear Blue, and Green in the Green Light; but of all the Colours, 'twill most strongly reflect the Scarlet Rays, and appear deepest of that Colour. This Experiment confirms the 8th Proposition, That Bodies appear of the Colour of those Rays that are most plentifully reflected from the Body to the Eye. Thus far Mr. Perks.

I can now only give you some of the Propositions of Sir *Is. Newton's* excellent Book of *Opticks*, relating to the Doctrine of *Light* and *Colours*, with something from him by way of Proof and Illustration in the most Eminent and Material Points.

Prop. I.

Lights which differ in Colour, differ also in Degrees of Refrangibility.

Prop. II.

The Light of the Sun consists of Rays different-ly Refrangible.

Prop. III.

The Sun's Light consists of Rays differing in Reflexibility; and those Rays are more Reflexible which are more Refrangible than others.

This, which seems to be a surprising Property of Light not before Discovered, he proves in his 9th and 10th Experiments of the First Book; where 'tis evident, that the Rays within a Prism, and refracted by its Base at their going out into Air, being by the Revolution of the Prism round its Axis made so oblique to the Base, as thereby to begin to be totally reflected by it: Then he shews that these Rays became first of all totally reflected, which before at equal Incidences with the rest had suffered the greatest Refraction; and the same thing he found to happen also when the Reflection was made by the common Base of two Prisms placed together as to make a Parallelopiped, as in the 10th Experiment.

Prop. IV. Probl. I.

To separate from one another the Homogeneous Rays of compound Light.

Prop. V.

Homogeneous Light is refracted regularly, without any Dilation, Splitting or Shattering of the Rays; and the confused Vision of Objects seen through refracted Bodies by Heterogeneous Light, arises from the different Refrangibility of several sorts of Rays.

This he proves in his 5th, 12th, 13th and 14th Experiments; from whence it appears, that the cross Position of a second Prism to refract the Light of the Sun which came to it from a former Prism, placed at the small Hole of a darkened Room, did not at all dilate the Image or Coloured Spectrum as to Breadth, nor increase its Dimensions that way: As also, that Homogeneous Light, refracted by a Prism, did not exhibit an oblong coloured Image, as Heterogeneous Light doth, but that a round

round Spot of it was by the Prism refracted exactly in the same Figure, and of the same Colour it was before the new Refraction; and moreover, that Flies and such like small Objects placed in Homogeneous Light, and viewed through a Prism, were not thereby at all rendered confused and indistinct as to appearance, whereas if placed in Heterogeneous Light, and viewed after the same manner, they seemed egregiously confused.

BOOK II. Prop. I.

The *Phænomena* of Colours in reflected or refracted Light are not caused by new Modifications of the Light variously impressed, according to the various Terminations of the Light and Shadow.

For by this 10th *Experiment*, Book I. 'tis evident that the Sun's Light being transmitted into a dark Room through the parallel Surface of two Prisms fastened together in the Form of a Parallelopiped, became totally of one Colour (either uniformly Yellow or Red) at its emerging out of the Prism: In the Production of which Colour the Confine of Shadows (he shews) can have nothing to do, because the Light changes from White to Yellow, Orange and Red successively, without any alteration of the Confine of Shadow: At both Edges of the emerging Light where the contrary Confines of Shadow ought to produce different Effects, the Colour is one and the same, whether it be White, Yellow, Orange or Red; and in the Middle of the emerging Light where there is no Confine of Shadow at all, the Colour is the very same as at the Edges, the whole Light at its Entrance being of one uniform Colour, whether White, Yellow, Orange or Red, and going on thence perpetually without any change of Colour, such as the Confine of Shadow is vulgarly supposed to work in its refracted Light at its Emergence.

Neither can these Colours arise from any new Modifications of the Light by Refractions, because they change successively from White to Yellow, Orange or Red, while the Refractions remain the same; and also because the Refractions are made contrary ways by parallel Surfaces, which destroy one another's Effects.

He shews also in *Experiment* the First of this 2d Book, That by applying an Iron Wire, or such like Body, to a proper Part of a very large Prism, posited about 20 Feet from the Hole of a darkned Room, you may so intercept the Rays at their Entrance, as to take away any one Colour (which you please) either wholly or in Part, out of the Spectrum or coloured Image, and leave the rest remaining; which shews that all Colours have an Indifference to any Confines of Shadow, and therefore the Differences of these one from another don't arise from the different Confines of Shadow, whereby the Light is variously modell'd, as hath hitherto been the Opinion of Philosophers. Again, a Lens being placed about 8 Feet from the Prism at the Hole, had a Paper placed in its Focus, which, when it was situate perpendicular to the Light, appeared of its own colour White, but when very much oblique appear'd Yellow and Red when inclined one way, and Blue, when turned another, and yet here the Confines of Light and Shadow, and the Refractions of the Prism remained in all Cases the same. And the reason of the Phenomenon (he shews) is this, That the

Paper in one Posture being more oblique to the more refrangible Rays than to the less, is more strongly illuminated by the latter than by the former; and therefore the less refrangible Rays are predominant in the reflected Light, and wherever they are so, they tinge the Light with Yellow or Red; as when the Paper being placed in the contrary way, and in an oblique Posture, the more refrangible Rays become Predominant; and they always tinge the Light with Blues and Violet Colours.

Prop. II.

All Homogeneous Light hath its proper Colour answering to its degree of Refrangibility; and that Colour cannot be changed by Reflections and Refractions.

This is plain by Experiment, for after he had separated the several sorts of Rays one from another (as he shews how to do in the *Experiments* belonging to the 4th *Propos.* of his First Book) and by that means got a quantity of Homogeneous Light; this Spot of Homogeneous Light was afterwards incapable of being changed by either Refraction or Reflection, and all Bodies placed in that Homogeneous Light still appear'd of its Colour, however different their own proper Colours were from that. From whence he concludes, That if the Sun's Light consisted but of one sort of Rays, there would be but one Colour in the whole World; nor would it be possible to produce any new Colour by Reflections and Refractions; and consequently all the variety of Colours depend upon the Composition of Light.

Prop. III. Problem

To define the Refrangibility of the several sorts of Homogeneous Light answering to the several Colours.

In this the Author is very curious and Exact, shewing the Laws of the Refractions out of Glais into Air, whence by the 3 Axioms of his first Book, the Laws of Refractions out of Air into Glais are easily derived. And finding by Experiment, that when Light goes out of Air thro' several contiguous refracting Mediums (as thro' Water and Glais) and thence goes out again into Air, whether the refracting Surfaces be parallel or inclined to one another; that Light, as often as by contrary Refractions 'tis so corrected, as that it emergeth in Lines parallel to those in which it was incident, continues ever after to be White: But if the emergent Rays be inclined to the Incident, the whiteness of the emerging Light, will by degrees, in passing on from the Place of Emergence, become tinged in its Edges with Colours. He thinks he can gather two Theorems (which he there gives) and by which the Refractions of the Rays of every sort, made out of any Medium into Air, are known by having the Refraction of the Rays of one sort; and also the Refraction out of one Medium into another, may be had as often as you have the Refractions out of them both into any third Medium. And these Theorems, if admitted into Opticks, would give a scope to treat that Subject voluminously after a new manner, not only by teaching those things which tend to the Perfection of Vision, but also by determining, Mathematically, all kinds of *Phænomena* of Colours which could be produced by Refraction.

Prop. IV.

Colours may be produced by Composition, which shall be like the Colours of Homogeneous Light, as to the Appearance of Colour, but not as to the Immutability of it; and the Constitution of Light, and those Colours, by how much more they are compounded, by so much are they less full and intense; and by too much Composition they may be diluted and weakened, till they cease. There may also Colours be produced by Composition, which are not fully like any of the Colours of Homogeneous Light.

Prop. V.

Whiteness, and all Grey Colours between White and Black, may be compounded of other Colours; and the Whiteness of the Sun's Light is compounded of all the primary Colours, mixed in a due Proportion.

This he proves by many Experiments, and in particular by this: That a Lens being placed to receive the colour'd *Spectrum* cast from a Prism at the Hole of a darkened Room, the Light in the Focus of the Lens converged, and there made a bright Spot, which received on a white Paper there, and in a right or normal Position to the Rays, appeared White on the Paper; but if either the Paper be moved towards the Hole, or behind the Focus of the Lens, it will presently begin to appear coloured with the usual Colours of the Prism. Now the Reason of its appearing White at the Focus, was, because there all the Rays were exactly mingled; for if any Colour, suppose the Red or Blue, were by the Interposition of some Body intercepted at the Lens; the Image in the Focus would never appear White, but some how coloured; so that to make Whiteness the Blending or Mixture of the Rays is necessary. And then in

Prop. VI. he proposes this Problem.

In a Mixture of Primary Colours, the Quantity and Quality of each being given, To know the Colour of the Compound.

Prop. VII.

All the Colours in the Universe which are made by Light, and depend not on the Power of Imagination, are either the Colours of Homogeneous Lights, or compounded of such; and that either accurately or very nearly, according to the Rule of the preceding Problem.

For Book II. Prop. I. he shews, That the changes of Colours made by Refractions, do not arise from any new Modifications of the Rays impressed by those Refractions, and by the various Terminations of Light and Shadow, as has been the constant and general Opinion of Philosophers. He has likewise proved, that the several Colours of the Homogeneous Rays do constantly answer to their degrees of Refrangibility (Prop. I. Lib. I. and Prop. II. Lib. II.) and that their degrees of Refrangibility cannot be changed by Refractions and Reflections (Prop. II. Lib. I.) and by consequence, that those Colours are likewise immutable: He has also proved directly by refracting and reflecting Homogeneous Lights apart, that their Colours cannot be changed (Pr. II. L. II.) He has proved also, That when the several sorts of Rays are mix'd, and in crossing pass through the same Space, they do not act so upon one another, so as to change each others colorific Qualities (Exp. X. L. II.) but by mixing their Actions in the *Sensorium* beget

a Sensation differing from what either would do apart; that is, a Sensation of a mean Colour between their proper Colours; and particularly, when by the Concourse and Mixtures of all sorts of Rays a white Colour is produced, the White is a Mixture of all the Colours which the Rays would have apart (Prop. V. Lib. II.) The Rays in that Mixture do not lose or alter their several Colorific Qualities, but by all their various kinds of Actions mix'd in the *Sensorium*, beget a Sensation of a middling Colour between all the Colours, which is Whiteness; for Whiteness is a Mean between all the Colours, having it self indifferently to all, so as with equal Felicity to be tinged with any of them: A Red Powder mixed with a little Blue, or Blue with a little Red, doth not presently lose its Colour; but a White Powder mixed with any Colour, is presently tinged with that Colour, and is equally capable of being tinged with any other Colour whatever: He has likewise shown, that as the Sun's Light is mixed of all sorts of Rays, so its Whiteness is a Mixture of the Colours of all sorts of Rays; those Rays having from the beginning their several colorific Qualities, as well as their several Refrangibilities, and retaining them perpetually unchanged, notwithstanding any Refractions or Reflections they may at any time suffer, and that whenever any sort of the Sun's Rays is by any Means (as by Reflection in *Exper. 9* and *10. Lib. I.*) or by Refraction, as happens in all Refractions, separated from the rest, then they manifest their proper Colours.

These things having been proved, says he, the Sum of all this amounts to the Proposition here to be proved; for if the Sun's Light is mixed of several sorts of Rays, each of which have originally their several Refrangibilities and colorific Qualities; and notwithstanding their Refractions and Reflections, and their various Separations and Mixtures, keep those their original Properties perpetually the same without alteration; then all the Colours in the World must be such as constantly ought to arise from the original colorific Qualities of the Rays, whereof the Lights consist by which those Colours are seen: And therefore, if the Reason of any Colour whatever be required, we have nothing else to do but to consider how the Rays in the Sun's Light have by Reflections or Refractions, or other Causes been parted from one another, or mixed together; or otherwise, to find out what sorts of Rays are in the Light by which that Colour is made, and in what Proportion; and then, by the last Problem, to learn the Colour which ought to arise by mixing those Rays (or their Colours) in that Proportion. After this in

Prop. VIII. and IX.

He shews, how by these discovered Properties of Light, to explain the Colours made by Prisms, and also those of the Rain-bow. And then in

Prop. X.

By the same discovered Properties of Light, he explains the Permanent Colours of Natural Bodies.

Shewing that their Colours arise from hence, that some Natural Bodies reflect some sort of Rays, and others other sorts, more copiously and strongly than the rest: As for Instance, *Minium*, or Red-lead, reflects the least Refrangible, or Red making Rays, most copiously, and thence appears Red.

But

But *Violets* reflect the most Refrangible most copiously, and thence have their proper Colour; and so of other Bodies. Every Body reflects the Rays of its own Colour more copiously than the rest, and from their Excess and Predominance in the reflected Light, hath its Colour.

Then in his Second Book, Part I. and II. he takes into Consideration the *Phenomena* of those Colours which are observed in thin transparent Bodies, making many excellent Observations about their Reflections and Refractions, and discovering many things as wonderful as they are certain. And here he finds new reason to conclude, that the colorifick Dispositions of Rays are also connate with them and immutable; and consequently, that all the Productions and Appearances of Colours in the World are derived not from any Physical Change caused in Light by Refraction or Reflection, but only from the various Mixtures or Separations of Rays, by virtue of their different Refrangibility or Reflexibility; and in this respect the Science of Colours becomes a Speculation as truly Mathematical as any other part of Opticks; that is, as far as they depend on the Nature of Light, and are not Creatures of the Imagination only. And in Part the Third, he discourses again of the permanent Colours of Natural Bodies, and shews the Analogy between them and the Colours of thin transparent Plates; as also shewing their Constitutions, whereby they reflect some Rays more copiously than others: As also about the Colours which arise from the Inflection of the Rays of Light: In all which there is intermixed many excellent Observations and curious Experiments relating to this most copious Subject. See more under Light and Colour, in Vol. II.

Promiscuous Observations and Experiments about Colours.

It's observable, that most transparent Bodies when they are either split, divided, or extended so that they have no sensible thickness upon their Surfaces, exhibit various Colours like those of the Rainbow. Thus is it with *Muscovy* Glass when split into exceeding thin Pieces, and fine Glass when blown at the Flame of a Lamp into Bubbles as thin or thinner than the finest Paper; and so we see it is in those Bubbles which Children make out of a mixture of Soap and Water, and those which arise from the shaking of almost any Chymical Oyle, or Spirit of Wine into very fine Froth.

Mr. Boyle found that one Grain of Cochineal dissolved first into a pretty quantity of Spirit of Urine, and then that Dissolution diluted with Water; would impair a sensible, though but a faint Colour, to fix Glasses of Water, each of which contained 45 Ounces and $\frac{1}{2}$, which amounts to above 125000 times its own Weight: And this shews the very great Divisibility of the Parts of Matter, as well as the Intestine Motion of the Parts of Fluid Bodies.

Dr. Hook in his *Microgr.* seems to think there are but two Original Colours, viz. Red and Blue, which, Page. 64. he defines thus:

Red is an Impression on the Retina, made by an Oblique and confused Pulse of Light, whose strongest Part precedes, and its weakest follows. Blue, an Impression made by an Oblique and confused Pulse of Light, whose

weakest part precedes, and its strongest follows. Out of these two he supposes all other Colours may by mixture, &c. arise.

The Ways by which a Liquor may suddenly change the Colour of another Liquor, or of another Body, Mr. Boyle thinks reducible to such as these.

1. By the Minute Particles of the Adventitious Liquors insinuating themselves into the Pores of the other, and filling them up either perfectly or in part; by which means the Light passing thro', the Liquor will be differently refracted from what it was before, when the Pores of it were only filled with Air, or perhaps some more subtle Fluid.

2. A Liquor may alter the Colour of a Body, by freeing it from those things which hindered it before from appearing in its genuine and proper Colour; as when Water washes off the Filth of ordinary Bodies, and other Lixiviums or Menstruums clear away, or four of the discoloured Rust of Metals, &c.

3. By making a Communion of the Parts of any Body, and that either by really subdividing them and making them less, or else by disjoining and separating such Aggregates or Clusters of Particles which clung together before.

4. Contrary to the last Way, the Colour of a Body may be changed by means of a Liquor's making Coalitions or Aggregates of several Particles, which before lay too scattered and dispersed to exhibit any Colour; and this way the new Colours of Precipitates may be supposed in part to arise.

5. A Liquor may also change the Colour of a Body, by dislocating and changing the Site and Position of the Parts of it: Thus bruised Fruits appear of a different Colour from their Ripe and Natural ones; and several Bodies are of a different Colour when dissolved in a Menstruum from what they had before.

6. The chiefest and most important way of all, as being that which doth contain many others within it, is by associating the Saline Corpuscles or any other sort of the more rigid ones of the Liquor with the Particles of the Body that it is employed to work upon, and by that means must needs alter the Figure, Position, Bigness and Degree of Motion of the Component Particles of that Body.

The Learned Dr. Grew thus sums up the Result of abundance of curious Experiments about the Causes of Vegetable Colours.

1. While the Sulphur and Saline Principles of Plants do only swim together, and are not yet united into one Precipitate, no Colour results from them, but the Contents are rather Limpid; as usually in the Roots and many other Parenchymous Parts.

2. But when they are united, and the Alkalines are predominant, they produce a Green Colour.

3. When the Sulphur and Alkaline are more equal, they make a Tawny.

4. When the Sulphur, Acid and Alkaline are nearly equal, they produce a Yellow.

5. When the Sulphur is predominant, and the Acid and Alkaline equal, it makes a Blue: But;

6. When the Sulphur and Acid are predominant to the Alkaline, it produces a *Purple*.

7. When the Sulphur is predominant to the Alkaline Principle, and the Acid to them both, it produces a *Scarlet*: But,

8. When the Acid is predominant to the Alkaline, and the Sulphur to them both, a *Blood-Red*; which is the highest and most Sulphurous Colour in Nature, *Anatom. of Plants*, P. 276, 277.

Experiments of the sudden Change of Colours.

1. Into a strong Solution of Sublimate in common Water (the Quantity, a Spoonful or two) drop 5 or 6 Drops of good Spirit of Urine (or almost any Volatile Spirit) and the Mixture will presently appear White; which Whiteness may immediately be destroyed by pouring in a little good *Aqua Fortis*. The Tribe of *Urnous Salts* are distinguished by producing this white Colour.

2. Drop a large Drop of Syrup of Violets on White Paper, it will spread and exhibit a tolerable blue Colour; then if you drop upon it any Acid Spirit or Stygian Liquor, as suppose a Drop of Spirit of Vitriol, 'twill immediately turn into a fine Red; whereas a Drop of Spirit of Urine or any Volatile Spirit would have turned into a lovely Green; as also will a Drop of the Solution of Copper in Spirit of Urine, though it be of a deep Blue it self. *Note*, To make the Experiment appear the better, 'tis best to stir about or mingle the Liquors with the Tip of your Finger.

3. The Essential Oil of Anniseeds in cold Weather coagulates and turns Whitish; yet if on this Whitish Ointment, spread on White Paper, you let fall but a Drop or two of good Oil of Vitriol, a Heat and Smoak will arise, and a Blood-red Colour will be produced.

4. The *Adiaphorous* Spirit of Box mingled with a Solution of Mercury in *Aqua Fortis*, made first a deep Yellow, and then in a Minute or two turned a deeply Red; and being digested a Day or two, let fall a white *Precipitate*. *Mr. Boyle*.

5. An Infusion of an Handful of sliced *Lignum Nephriticum* in 4 Pound of Spring Water all Night, will give the Liquor that is poured off into a clear Glass Vial a Colour almost like that of Gold, provided you hold up the Vial between your Eye and the Light; but when you hold it from the Light, so that your Eye be between the Light and it, it will appear of a deep and lovely Blue Colour; which fine Blue Colour a few Drops of any Acid Liquor will immediately make disappear, and about as many of Oil of Tartar per Deliquium or any such fix'd Alkalizate Liquor will again restore.

6. Every one knows, that red Rose-Leaves held a while in the Smoak of Sulphur will turn pale; and yet if you infuse old discoloured Rose-Leaves that have been long dried in a Glass of Water, it will scarce impart any Colour to the Liquor; but on the dropping a due Quantity of the Spirit of Sulphur, the Liquor will turn into a lovely Red.

7. Tincture of Red Rose-Leaves drawn with Water and a little Oil of Vitriol was put into a clear Vial about half full of fair Water, in such a Proportion as that the Mixture was very red, but yet transparent; then into it was dropt leisurely a little Spirit of Urine, and the Mixture being shaken, exhibited a fine Greenish Blue.

8. If into a Spoonful of the Infusion of Pow-

der of Logwood in Water, which will be Red, you drop two or three Drops of Spirit of Urine, it will produce a lovely Purple; but if the Water which drew the Tincture from the Logwood, had been impregnated with Spirit of Salt, the Drops of Spirit of Urine, instead of Purple, would have produced a Yellow Colour.

9. Three or four Drops of Oil of Tartar per Deliquium drop'd into a Spoonful or two of clear Solution of Sublimate in common Water, though the Liquors are both Colourless, will in a trice produce a deep Yellow Colour; which, by dropping in four or five Drops of Oil or strong Spirit of Vitriol, may be as soon destroyed and made to vanish; and by putting in more of the Oil of Tartar, recovered again, &c. The Tribe of Lixivate Salts are known and distinguished by this Test, that they will all produce this Yellow Colour, when mix'd duly with a Solution of Sublimate.

10. Dissolve Filings of Copper in good Spirit of Fermented Urine, the Solution will be deeply Blue; but if into a Spoonful of this you drop 2 or 3 Drops of Oil of Vitriol, the Ceruleous Colour will immediately vanish, and the Liquor become clear as Rock-Water.

11. If three times its Weight of Oil of Vitriol be in a Glass Retort placed in Sand, drawn off from a Quantity of good Quick-silver, it will leave a Calx as white as Snow; which yet as soon as ever common Water is poured on it, turns into one of the brightest and loveliest Yellow Colours in the World.

12. Dissolve Camphire in Oil of Vitriol, and it will impart a deep and almost opake Red on the Menstruum, though it self be White, and the Menstruum, if good, clear and transparent. And if into the Solution you pour a little Water, the Red Colour will vanish in a trice, the Menstruum grow pale, and the Camphire be recovered again in its pristine Form.

A CATALOGUE of the Simple Colours.

1. *Spanish White*, made of Chalk and Alum, burnt together.
2. *Lapis Armenius*, supposed to be the same with the common *Blue Bice*.
3. *Ultramarina*, made of the bluest *Lapis Lazuli*, which is freest from Gold Veins by Calcination.
4. *Smalt*, made of Zaffer and Pot ashes calcin'd together in a Glass Furnace.
5. *Lirmose*, supposed to be the Juice of a Plant.
6. *Indico*, by some said to be a kind of Mud adhering to the Froth about Reeds in India. Others say it is a Plant like *Rosemary*, called *Intil*, growing in *Cambria*, which is gathered and dried, then wetted with fair Water, and beaten to a Mud; this Operation being repeated, it is dried and fitted for use.
7. *Indian Ink*, whose Comparison is supposed to be burnt Rice.
8. *Cerus* or *Pyrmiridium*, is the Rust of Lead made by a Vaporous Calcination.
9. *Masticot*, is a kind of improper Calx of Tin.
10. *Gambodia*, or *Gutta Gambæ*, is supposed to be the inspissated Juice of a Plant that comes from the Indies.
11. *Oker*, a sort of Natural Earth.
12. *Orpiment*, a fat inflammable Mineral, justly ranked

ranked amongst *Poisons* for its extream Corrosive Quality.

13. *Umber*, a native Earth.

14. *Red-Lead*, made of Litharge or burnt Lead, by a Reverberatory Calcination, or of *Ceruss* put on a Platter over the Fire, which must be continually stirred till it has acquired a Red-Lead Colour.

15. *Burnt Oker*, is the common Yellow *Oker* burnt in open Fire.

16. *Cinnabar* or *Vermillion*, there are two sorts, Native, or the *Minium* of the Ancients, which is a Mineral that yields *Quick-silver*, whereof, and of *Sulphur*, it chiefly consists. It is found in the Mines of *Itria*.

The *Falsitious Cinnabar* is that which we now use; and is made by a Sublimation of *Mercury* and *Sulphur*.

17. *Carmin*, made of *Cochineal*.

18. *Lake*, is made of *Flocks* dyed, or Shavings of *Scarlet-Clork*, or of the *Cochineal Insest*, or else of *Kermes-Berries*, their Tincture being extracted with a Lee of *Pot-ashes*, and then precipitated with a Solution of *Rock-Allum*. After the same manner a *Lake* may be made of a Plant or Plover. There is also another sort of *Lake* made of *Gunn-Lac*, by extracting its Tincture with *Urine*.

19. *Sarguis Draconis*, is the Gum of a Tree which looks like dried Blood; 'tis brought out of several Places in the *East-Indies*.

20. *Earth Reddle*, or *Ruddle*, found in many Places of *England*.

21. *Lamb-black*, made of Soot of *Rosin* or *Pitch*, burnt in Places built on purpose for it, that keep in the Smoke.

COLUMN, in the Art Military, is the long File or Row of Troops, or of Baggage of an Army in its Match. To march in a *Column*, is to march a great Depth, or in a long File, instead of making a large Front. An Army marches in one two, three, or more *Columns*, according as the Ground will allow, and the General sees expedient.

COLUMN, in Architecture, is properly that round long Cylinder or Part of a Pillar which is called the *Shaft*, *Trunk*, *Fust*, the *Scapus*, *Vivo*, *Tige*, &c. containing the Body of it from Spire to the Base, or from the *Astragal* of the Base to the Capital.

COLUMNÆ Cordis, are the Muscles and Tendons by which the Heart is contracted and dilated.

COLURES, are two great Circles imagined to pass through the Poles of the World, one of them through the Equinoctial Points *Aries* and *Libra*, and the other through the Solstitial Points *Cancer* and *Capricorn*, these are called the *Equinoctial* and *Solstitial Colures*. And these divide the *Ecliptick* into four equal Parts or Quarters, which are denominated accordingly: And the Points where these pass through are called the *four Cardinal Points*.

COLPUS, the same with *Sinus*.

COLUMELIA, the same with *Cion*.

COLUMMA Nasi, is the Fleishy Part of the Nose, prominent in the Middle near the upper Lip.

COLUMMA Oris, the same with *Coin*.

COLUMN, in Architecture, taken in the largest Sense, is a sort of Pillar of a round Form, which

serves to support or adorn a Building consisting of a Base, a Shaft or Shank (which is properly the *column*) and a Capital. *Columns* are different according to the several Orders of Architecture.

The *Tuscan* being the shortest and most simple, is seven Models long, comprehending its Base and Capital, and diminished a fourth Part of its Diameter.

The *Doric* ought to be Seven and a Half, or Eight Diameters long; and its Base and Capital are somewhat more beautify'd with Mouldings.

The *Ionick Column* is nine Diameters long, and hath its Capital set off with *Voluta's* or curl'd Scrolls, differing in that respect from others as well as in its Base, which is peculiar thereto.

The *Corinthian* is the Richest of all, having two Rows of Leaves for the Ornament of its Capitals with Stalks or Stems, from whence shoot forth small *Voluta's*. Its Length is Ten Diameters.

The *Composit Column* is likewise Ten Diameters long, and its Capital is made like that of the *Corinthian*, with the Angular *Voluta's* or the *Ionick*.

COMA *Somnolentum*, is a deep Sleep, less than a Lethargy, without a Fever, wherein the Patient being awakened, answers to any Question propounded to him, but falls into a profound Sleep again, with his Mouth open and his under Jaw fallen, more like to one dead than alive. *Blanchard*.

COMA *Vigil*, waking Drowsiness, is a Disease wherein the Patients are continually inclined to Sleep but scarce can Sleep, being affected with a great Drowsiness in the Head, a Stupidity in all the Senses and Faculties, and many times with a *Delirium* too.

COMB, in a Ship, is a small Piece of Timber set under the lower Part of the *Beak-head* near the Middle; it hath two Holes in it, and supplies to the *Fore-Tacks* what the *Chiefs-Trees* do to the Main ones, that is, to bring the Tacks aboard.

COMBATANT, the Herald's Word for two Lions born in a Coat of Arms in a Fighting Posture, Rampant, and their Faces towards each other.

COMBINATION, is the Art of finding how many different Ways a certain given Number of things may be varied, or taken one and one, two and two, three and three, &c. See Vol. II.

COMBUST, a Term in Astronomy, when a Planet is not above 8 Degrees and 30 Minutes distant from the Sun, either before or after him; he is said then to be *Combust*, or in *Combustion*.

COMETS, are what are commonly called *Blazing-Stars*. The Ancients, especially *Aristotle* and his Followers, supposed them to be Meteors or Exhalations set on Fire in the highest Region of the Air: The Modern Astronomers have found them to be above the Orbit of the Moon, but yet to descend so low as to move in the Regions of the Planets: It is not improbable but that they may be a sort of very Eccentric Planets, and move Periodically about the Sun.

Mr. *Arout*, a French Gentleman, was the first as I can find, who pretended to predict what would be the future Motion of a Comet; which he did for one that appeared Jan. 1664, and sent Copies of them to the Secretary of the Royal Society, Jan. 2. 1664, *New Style*. He also did the same for a second Comet, which appeared the Year following.

Hevelius, in his *Prodromus Cometicus*, saith, he is almost positive no Account can be given of the *Phænomena of Comets*, without supposing the Annual Motion of the Earth.

Measuring the *Comet* in the Year 1664, he found it to be distant from the Earth above 5000 Semi-Diameters of the same; and that its true Diameter was then 25600 *German Miles*, which is 3 times as long as the Diameter of the Earth.

He supposes all of them to move round the *Sun* as their Center, and to be a kind of Spurious Planets.

Their Train or *Coma* he takes to be occasioned by the Beams of the *Sun* falling on the Head of the *Comet*, and passing through the same Reflected and Refracted.

Afterwards, in 1668, he published his *Cometographia*, wherein he supposes, that the Trajectory of a *Comet* is nearly Rectilinear, or that they always move in a straight Line.

Yet he supposes also a Motion impressed, and an Inclination of the *Comet's* Disk to the *Sun*, as two Causes why *Comets* may sometimes deviate from a straight Course, especially about the Beginning and End of their Appearance.

He observes, That this Line is something near that of a *Parabola* sometimes, but never is the Ark of any Circle: Also that there is in *Comets* a Libratory Motion, like that in the *Moon*.

The famous *Sr. Isaac Newton*, in his excellent *Principia Philos. Mathem.* hath a large Discourse of *Comets*, p. 473, &c. where he proves.

1. That they are above the *Moon*, and in the Region of the Planets, because they have no Diurnal Parallax, but an Annual one: For those *Comets* which move forward according to the Order of the Signs, are all at their Exit or Disappearance, slower in their Motion than they were before, or (Retrograde) if the Earth be between them and the *Sun*; but they move swifter than ordinary when they begin to disappear, if the Earth be in opposition to the *Sun*: And on the contrary, if they move contrary to the Succession of the Signs, and have the Earth between them and the *Sun*, then they move more swifter than ordinarily at their Exit; but if the Earth be in opposition, they move slower, and retrograde towards their going off. This chiefly depends on the Motion of the Earth, as it is in the Planets, who, according as the Earth's Motion agrees with, or is contrary to theirs, appears sometimes retrograde, sometimes to move slower, and other times more swiftly.

If the Earth move the same way with the *Comet*, and swifter by its angular Motion round the *Sun* than the *Comet*, the *Comet*, when beheld from the Earth, will appear to be Retrograde.

And if the Earth move slower than it, the Motion of the *Comet* (subducting the Motion of the Earth) will be, to appearance, slower.

But if the Earth move a contrary way to the *Comet*, it will then appear to move swifter than the Earth: All which he illustrates and proves, and shews also a Way from the *Comet's* Parallax to find its distance.

From the Consideration also of the Curvity of the Way of a *Comet*, he concludes, That when they disappear, they are much below the Orb of *Jupiter*; And that in their *Perigeums* and *Periheliums*, they often descend below the Orbits of *Mars* and the inferior Planets.

From the Light also of the apparent *Star* that is in the Head of the *Comet*, he concludes their Vicinity to the *Sun* and Earth; and that they can by no Means be in the Region of the fixed Stars, as some have imagined, for then their Heads could no more be enlightened by the *Sun*, than the Planets are by the fixed Stars.

Considering also the Obscuration of the *Comet* by that thick Fume or Vapour with which its Head is always encompassed, he concludes, That they must often descend down below the Sphere of *Saturn*, as he had before found by their Parallax. The same thing he concludes also by examining into the Cause of the *Coma* or Tail, and then draws these Corollaries.

1. That *Comets* shine by the Light of the *Sun's* Beams reflected from them.

2. That the Heavens are devoid of all Resistance, such as our Air and other Mediums have: For these *Comets* move every way with all the freedom that can be, obliquely, directly, and often against the Course of the Planets, and yet can continue their Motion for a very long while, even so. And therefore the Celestial Regions cannot be filled with Matter like the *Cartesian Vortices*, but must be almost void Spaces.

Next, in *Propos. 40. Book 3.* he proves, That *Comets* move round the *Sun* in Conick Sections, having their *Umbelici* in the Center of the *Sun*; and that by Lines drawn from themselves to the *Sun*, they describe *Area's* proportional to their Times of Revolution, as the other Planets do: And he seems to think them a kind of Planets, and that they revolve in real Elliptical Orbits, though they nearly approach to *Parabola's*. From which Proposition he concludes,

1. That if *Comets* do ever come about again, their Orbits are very Eccentric Ellipses; and that their Periodical Times are to those of the Planets in a Sefqualteral Ratio of the Tranverse Axes; and therefore *Comets* being usually above the Planets, and describing Orbits of longer Axes than they, do really move slower than they; and particularly, that if the Ax of the Orb of a *Comet* were 4 times as long as the Ax of *Saturn's* Orbit, the Time of the Revolution of the *Comet* to that of *Saturn*, would be $4 \times \sqrt{4}$, or 8 to 1; that is, 240 Years.

After this, in several *Lemma's*, he prepares the Way to determine the Species of the Conick Section a *Comet* describes; to find its Place at any intermediate given Time; and to determine the Trajectory from three Observations, which he illustrates by Examples.

Then he proceeds to consider more particularly what the Bodies of *Comets* are, and concludes that they are solid, compact, fix'd and durable, like those of the other Planets. Refuting the old Opinion of their being Meteors or Exhalations from this, That in their Transits, so near the *Sun* as we find they do go, they would be perfectly dissipated, dispersed and destroyed.

The Heat of the *Sun* he had before shewn to be as the Density of the Rays, or reciprocally as the Squares of the Distances of Places from the *Sun*: Wherefore since the Distance of the *Comet* which appeared in the Year 1680, being in its Perihelion December the 8th, was then to the Distance of the Earth from the *Sun* as 6 to 1000 nearly. The *Sun's* Heat in the *Comet* at that time was to his Heat with us at Midsummer as 1000000 to 36, or

28000 to 1; whereas the Heat of boiling Water, as he tried, was but very little more than triple the Heat of our dry Earth exposed to the *Midsummer Sun*; and the Heat of red hot Iron he Conjectures to be about 3 or 4 times as great as that of boiling Water: Wherefore the Heat of the dried Earth or Body of the *Comet* in its *Perihelion*, was near 2000 times as great as that of red hot Iron; and consequently, if the *Comet* had been a Meteor, or an Aggregate of Vapours and Exhalations, the Sun would have rendred it invisible.

The *Comet* therefore acquired so great, so immense a degree of Heat in its *Perihelion*, that it must needs be a long time before it will be cold again; for he computes that a Globe of red hot Iron of the Dimensions of our Earth, would scarce be cool in 50000 Years. If therefore we suppose the *Comet* to cool 100 times as fast as red hot Iron, yet since his Heat was 2000 times greater than that of red hot Iron, if you suppose his Body to be of the same Bigness of our Earth, he will not be cool in a Million of Years.

He observes also, that the Tails of all *Comets* are longest and largest after their passing from the Sun, or just after their *Perihelions*; which shews that the Sun's Heat contributes to the encrease of the Tail: Whence 'tis more than probable, that the Tail of a *Comet* is only a long and very thin Smoak or train of Vapours which the ignited *Nucleus*, or the Head of the *Comet* emits from it. And this Notion he confirms after this, by refuting the two other Opinions about the Origin of the Tail of a *Comet*.

For some will have it to be only the Sun-Beams shining thro' the Head of the *Comet*, as they do, thro' a Crevise into a dark Place, and by that Means come to appear in that Form.

But this Notion he shews will not hold, because the Reason that the Sun-Beams appear thus lucid when his Rays shine thro' an Hole or Chink into a dark Place, is because the Light is reflected from the Particles of Smoak, small Dust, &c. which continually fly to and fro in the Air, and therefore is always more splendid where the Air abounds with the most gross and greatest number of Particles of this Nature. But in a thin and clearer Air, no such Appearance can well be seen; and consequently in the Celestial Regions, where probably there is little or no Matter to reflect, cannot be visible: For Light, as in the Sun-Beams only, is not discernable, but only so far as it is from thence reflected to our Eyes.

Others will have the Tails of *Comets* to be formed by the Refraction of Light as it passes thro' the Head of the *Comet* to the Earth: But this Opinion he thinks prest with many scarce answerable Difficulties; for first, the Tails of *Comets* never appear adorned with various Colours, which yet are usually the inseparable Concomitants of Refraction. Again, the Light of the fix'd Stars and Planets coming to us directly, and transmitted distinctly, plainly shews that the Celestial *Mediums* it passeth thro' have no refracting Power. And as to the Radiation and Twinkling of the fixed Stars, that ought to be attributed rather to a Refraction in our Eyes, or to be occasioned by the tremulous Motion of the Air, because when we look on them thro' a Telescope, there is no such thing. The Tremor of the Air, and of the ascending or descending Vapours, may easily occasion a little

quick successive Distortion of the Rays from so small a Point as the Pupil of one's Eye; but they cannot do so from the much larger Aperture of a Telescope's Object Glass, which is the Reason why there is an apparent twinkling in the former, but not in the latter Case; and the Cessation of the Scintillation in the Latter, is a Demonstration that there is a regular Transmission of the Rays of Light without any sensible Refraction.

Lastly, If the Tails of *Comets* were produced by the Refraction of the Sun's Light shining thro' them towards us, and according to the Figure of the Heavens, were reflected to Parts opposite to the Sun, that Deflection in the same Regions of the Heavens must always be made towards the same Parts: But this, by plain and undoubted Observation, hath been found to be false in Fact, and therefore this account cannot be the true one.

That the Tails or Beards of *Comets* do arise from the *Nucleus* or Head, and ascend towards the Regions opposite to the Sun, is confirmed by the Laws which they observe; as, that lying in the Planes of the Orbits of *Comets* which pass thro' the Sun, they deviate from the Opposition of the Sun always towards those Parts, which their Heads, as they move forward, leave in those Orbits: That to a Spectator placed in these Planes, they appear in Parts directly opposite to the Sun; but that if the Spectator deviate a little from these Planes, their Deviation will become sensible, and every Day appear greater and greater: That, the Deviation, all things consider'd, is less where the Tail is oblique to the Orbit of the *Comet*; as also when the Head of the *Comet* approaches nearer to the Sun, especially if the Angle of the Deviation be observed near the Head of the *Comet*; besides that those Tails which do not deviate appear straight, but those that do, appear Curved: That the Curvature is greater where the Deviation is greater, and more sensible where the Tail is of the greater length; for in short ones it is hardly observable: That the Angle of Deviation is less near the Head of the *Comet*, and greater near the opposite Extreme, and therefore that the Tail turns its Convex Parts towards the Place from which the Deviation is made, and which are in a Right Line drawn from the Sun thro' the Head of the *Comet*, and produced infinitely: And that those Tails which are larger and longer, and which shine brightest, are more splendid towards their Convex Sides, and are better defined, or more distinctly terminated there, than on their Concave Sides.

Wherefore the Phenomena of the Tails of *Comets* depend upon the Motion of their Heads, and not upon that Region of the Heavens in which the Head is seen, and therefore do by no means arise from Refraction in the Heavens, but have their Matter supplied from the Head.

For, as in our Air, the Smoak of any kindled Body ascends upright if the Body be at rest, but obliquely if it have a Lateral Motion any way: So in the Heavens, where Bodies gravitate towards the Sun, Smoak and Vapours ought to ascend up from the Sun, and that in a Right Line, if the Smoaking Body be at rest, or obliquely, if it move any way laterally, and by its progressive Motion doth always desert those Spaces from whence the Superior Parts of the Vapours had ascended: And this Obliquity will be less where the Ascent of the Vapours is more swift, viz. near the Sun, and near the

the smoking Body. From the Diversity of this Oblivity the Column of the ascending Vapour will be incurved; and because the Vapour in the Precedent Side of the Column, is something newer or more recent than the other, it will therefore be a little more dense, and consequently more copiously reflect the Light, and be defined or terminated more distinctly than the other Side.

That there may arise from the Atmosphere of *Comets*, Vapours enough to take up such immense Spaces, may be understood from the Rarity of our Air: For Air, near the Surface of our Earth, takes up a Space 850 times as large as Water of the same weight with it; and therefore a Column of Air of 850 Foot high, weighs no more than one of Water of but one Foot high, if they have both the same Base. But a Column of Air of the height of the whole Atmosphere, weighs no more than a Column of Water of about 33 Feet high, and of the same Base; and therefore if from this whole Column of Air you subtract the lower Part as far as the Height of 850 Foot, the remaining Column will weigh equal to a Column of Water of 32 Foot; from whence (by that Hypothesis which is now confirm'd by many Experiments) it may be fairly concluded, that the Compression of the Air is as the Weight of the incumbent Atmosphere; and that Gravity is reciprocally as the Square of the Distance of Places from the Center of the Earth. I found by Circulation, saith he, (the Ground of which he gives in *Prop. 22. Lib. 2.*) that Air, at the Distance of our Earth's Surface, of only one Semi-diameter of the Earth, is more rare than it is with us in a Ratio much exceeding that which all the Space below the Orb of *Saturn* bears to the Diameter of a Globe of only one Inch in length. And therefore a Globe of our Air of only one Inch in Diameter, if it had but the same degree of Rarity which our Air hath at the Distance of 4000 Miles, or of the Earth's Semi-diameter from us, would more than fill all the Regions of the Planets, as far as the Sphere of *Saturn*, and much farther. Wherefore since Air, as you go higher, will still grow immensely rare, and that the *Coma* or Atmosphere of a *Comet*, counted from its Center is about 10 times higher than the Superficies of the Nucleus, the Tail of it ascending much higher, must needs be exceedingly rare.

And tho', because of the great Crassitude of the Atmosphere of *Comets*, and the great Gravitation of Bodies towards the Sun, and the Gravitation of the Particles of Air and Vapour towards one another, it may be that the Air in these Celestial Spaces, and in the Tails of *Comets* may not be rarified quite so much, yet 'tis plain by this Computation, that a very little Quantity of Air and Vapours will suffice to solve all the Phenomena of the Tails of *Comets*.

For the very great Rarity of the Tails of *Comets* may be concluded by the fix'd Stars so plainly appearing thro' them, as we find they do. The Atmosphere of our Earth shining with the Sun's Light, tho' perhaps its Thickness be but a few Miles, yet quite extinguishes all the Light of the fixed Stars, and obscures the Moon it self; whereas the immense Thickness of the Tail of a *Comet*, illustrated as our Atmosphere is by the Rays of the Sun, will permit the smallest fix'd Stars to be seen thro' it without any Diminution of their Brightness.

And the Tails of most *Comets* have no greater Splendor than the Sun-beams exhibit when reflected from a Stream of Motes, Dust, &c. in a darken'd Room, of but one or two Inches in Thickness.

At what time the Vapour ascends from the Head to the Extremity of the Tail, may be almost discovered by drawing only a Right Line from the End of the Tail to the Sun, and then noting the Place where that Right Line cuts the Trajectory: For the Vapour in the Extremity of the Tail, if it ascend in a Right Line from the Sun, will begin its ascent at the time when the Head of the *Comet* is in the Place of Intersection.

But indeed the Vapour doth not ascend in a Right Line from the Sun, but by retaining the Motion of the *Comet* which it had before its Ascent, and compounding it with the Motion of its Ascent, it ascends obliquely; wherefore it will be a truer Solution of the Problem, to suppose the Right Line which intersects the Orbit to be parallel to the Length of the Tail, or rather (because of the Curvilinear Motion of the *Comets*) that it diverge from the Line of the Tail. By this means I found that the Vapour which was in the Extremity of the Tail, Jan. 25. began to ascend from the Head before December 11. and therefore had taken up more than 45 Days in its Ascent: But all that long Tail which appeared December 10. ascended in the space of those two Days, which were then just past since its *Perihelion*; wherefore the Vapour at the Beginning, when the *Comet* was near the Sun, ascended prodigiously swift, and afterwards continued to ascend with a Motion retarded by the Gravity of the Particles, and by that Ascent encreaseth the Length of the Tail: But the Tail, as long as it appeared, consisted almost all of that Vapour which ascended from the Time of the *Perihelion*; and the Vapour which first ascended and composed the Bounds of the Tail, did not vanish till it was both too far off the Sun to be illuminated by him, and off us to be visible. Hence also the Tails of *Comets* which are shorter, do not ascend with a quick and continual Motion from the Head, and then presently vanish and disappear; but are permanent Columns of Vapours and Exhalations, gathered from the Head by a very gentle Motion, and in a great space of Time; which yet by participating of that Motion of their Heads which they had at the Beginning, they continue easily to move along with their Heads thro' the Celestial Regions. And from hence it may again be concluded, That the Heavens are filled with no Matter that hath any Power of Remittance or Resistance in it; since only the Planets and *Comets* themselves, but even such very rare Bodies as the Tails of *Comets*, can both move there very freely and swiftly, and also continue that Motion for a vast while together.

This excellent Author supposes the Ascent of Vapours into the Tails of *Comets*, to be caused by the Rarefaction of the Matter in the Atmosphere at the Time of the *Perihelion*. Smoak, saith he, in a Chimney ascends up by the Impulse of the Air in which it swims or floats: And Air, rarify'd by Heat, ascends by the Diminution of its Specifick Gravity, taking the Smoak, and carrying it up along with it. Why should not the Tail of a *Comet* be, after the same manner, supposed to be raised by the Sun? for the Sun-Beams do not agitate any Mediums which they pass through, but only by Reflection and

and Refraction. The reflecting Particles being made warm by this Action, do warm the Æther, with which they are compounded. This Æther (or whatever you will call it) being rarified by the Heat communicated to it, and having its Specifick Gravity by which it descendeth toward the Sun before, now diminished by this Rarefaction, ascends and carries along with it those reflecting Particles of which the Tail of a *Comet* is composed.

To the Ascent of these Vapours, it conduces that they are carried by a circular Motion round the Sun, and consequently endeavour to recede from the Sun, while the Atmosphere of the Sun, and the Matters of the Heavens, doth either really rest, or else being moved with no other Motion than what they have from the Sun's Circumrotation, are moved very slowly. These are the Causes of the Ascent of Vapours into the Tails of *Comets*, when they are within the Confines of the Sun, where their Orbits are more curved, and where *Comets* being within the denser, and therefore heavier Atmosphere of the Sun, have their Tails of the greatest Length. For the Tails which are now produced by preserving their own Motion, and at the same time gravitating towards the Sun, will move about him in Ellipses like their Heads, and by that Motion will always accompany and freely adhere to their Head: For the Gravity of the Vapours towards the Sun, will no more cause the Tails of the *Comets* to forsake their Heads, and to fall down towards the Sun, than the Gravity of the Heads can make them fall off from their Tails. But their common Gravity they would either fall down to the Sun together, or be together retarded in their Ascent: and therefore this Gravity doth by no means hinder, but that the Heads and Tails of *Comets* may receive and retain any Position to one another, which either the above-mentioned Causes, or any other may produce.

These Tails therefore which are thus produced in the *Perihelions* of *Comets*, will go off along with their Heads into remotely distant Regions, and from thence, either with the *Comets* themselves, return again to us after a long series of Years; or rather being there rarified vanish quite away by little and little: For afterwards in the descent of their Heads towards the Sun, some little short Tails ought gradually and slowly to be produced from the Heads, which afterwards in the *Perihelions* of such *Comets* descend down into the Sun's Atmosphere, must needs be immensely encreased; for the Vapours in those free Spaces will continually be rarified and dilated, whence it comes to pass, that the Extremity of the Tail is always much broader than the End next to the Head of the *Comet*.

And it appears agreeable enough to reason, to suppose, that those Vapours which are thus dilated, rarified and diffused throughout all the Celestial Regions, may by little and little by their own proper Gravity, be attracted down to the Planets, and become intermingled with their Atmospheres. For as to the Constitution of this Earth of ours, it is necessarily required that there should be Seas, that from them vast quantities of Vapours being raised, by the Heat of the Sun, they may either gather into Clouds, and then fall down in Rain to moisten and nourish the whole Earth, and to render it Fertile; or else (as some Philosophers think with good Reason) being condensed by the cold Tops

of Mountains and Hills, run down from thence, and form Springs, Fountains and Rivers; so for the Conservation of the Seas and Moisture of the Planets, *Comets* seem necessarily requisite: from whose condensed Exhalations and Vapours all that Moisture which is consumed in Vegetations and Putrefactions, and turned into dry Earth, may by degrees, be continually re-supplied and recruited: For all Vegetables do entirely grow and encrease from Liquors, and then, as to their greatest Part, do turn by Putrefaction into dry Earth, and a Slime perpetually is precipitated to the Bottom of putrifying Liquors. From hence the Quantity or Bulk of dry Earth must continually increase, and the Liquors or Moisture of our Globe continually decrease, and at last be quite evaporated and lost, if they had not as continual a Supply from some Part or other of the Universe. And I do also suspect (saith our Author) that that Spirit which is the finest, subtlest, and best Part of our Air, and which is necessarily requisite to the Life and Being of all things, comes chiefly from *Comets*.

The Atmosphere of *Comets*, as they descend towards the Sun, are sensibly diminished by their running out to afford Matter to produce the Tail, and (certainly in that Part which looks towards the Sun) do grow more narrow and contracted; but after this, as the *Comets* recede from the Sun, when they do not so much run out into the Tail, they are enlarged, if *Hewelius* hath rightly observed the Phenomena. But they appear least of all when the Heads of the *Comets*, having been so exceedingly heated by the Sun (in the *Comet's* *Perihelia*) blaze out into those vastly great and bright shining Tails, and when the Nuclei being perhaps covered with a black thick Smoak, are covered by the lower Parts of the Atmosphere: for all Smoak is greater and more black and thick when the Heat is very great.

Thus the Head of that *Comet* of which we have been speaking, at equal Distances from the Sun and the Earth, appeared more obscure after the *Perihelion* than before. For in December it appeared but like a Star of the 3d Magnitude, whereas in November it was like one of the First or Second.

He concludes therefore, that *Comets* are a kind of Planets moving round the Sun in very excentric Orbits; and as those Planets which are nearest the Sun, and revolve about him in lesser Orbits, are lesser than others, so he supposes those *Comets*, which in their *Perihelion* come very near the Sun, are less than others, and revolve in lesser Orbits.

If a *Comet* in its descent to, or ascent from the Sun, approach near to a Planet as it passes by, and its Plain be different from that in which the Planets move: By its attractive Power it will, agreeably to the universal Law of Gravitation of Bodies, draw it from the Plain in which it before moved, and so cause it afterward to move to a new one, inclined to the former, but passing thro' the Sun as the former did.

Hence 'tis possible, That though the Planets originally revolved in the same common Plain, yet by the subsequent Attraction of *Comets*, their Plains may be inclined to one another and different, as 'tis certain, de facto, they now are.

Dr. Gregory, in his *Astronomical Phys. & Geometrica Lib. 5.* shews, That the ancient Astronomers and Philosophers believed *Comets* to be very Eccentric

central Planets revolving round the Sun ; and that it was the Peripatetick School which brought up the Notion of their being nothing but Meteors and below the Moon.

Cassini observed of the *Comet* which appeared in the Year 1680, that it was but 22 or 23 Degrees from the Sun, and yet to us appeared to have half its Globe illuminated, or not to be either *falcated* or *gibbous* ; which also was observed of the *Comet* in the Month of *April*, 1665 ; and from thence he concludes justly, that those *Comets* were at that time not only higher than the Moon, but also than the Sun himself ; because *Mercury* and *Venus* at that distance from the Sun do never appear full but when they are so.

The same Person thinks it is too rash in the Modern Philosophers to condemn as false and ridiculous, the Notion that hath been long received of the bad Prefages of *comets* ; for he saith, If the Tail of a *Comet* should be intermingled with our Atmosphere, or if the Matter of it should, by its Gravity, fall down upon our Earth, it may induce changes in our Air, that may be very sensible among Animal and Vegetible Bodies. *Astron.* p. 408.

And p. 412. he shews the Way of determining the Way and apparent Place of a *Comet*. And p. 418. from four observed Places of a *Comet* to determine its Trajectory, if it were Rectilineal ; and at p. 421. he gives the Method of determining the true Trajectory of a *Comet*. At p. 446. he shews how to find the Position of the Bodies of a *Comet's* Orbit, and when the *Comet* will be in them ; and p. 447. to find the Inclination of the Plane of this *Comet's* Orbit to that of the Ecliptick. And after this he shews how to correct the Trajectory, and to determine the Heliocentrick and Geocentrick Place of the *Comet* in the Trajectory, determined by the Method before given, for any given Time ; as also to make necessary Tables for readily finding the Places of *Comets*. From p. 448. to 460.

The Famous *James Bernoulli* in his *Systema Cometarum*, An. 1682, supposes, That there is some primary Planet revolving round the Sun in the Space of 4 Years and 157 Days, and at the Distance from him of 2583 Semi-diameters of the *Magnus Orbis* : The primary Planet he supposes either from his vast Distance or Smallness not to be visible to us, but however, to have, at various distances from him, several Satellites moving round him (though none descending so low as the Orbit of *Saturn* ;) and that these becoming visible to us when they are in their *Perigeum*, are what we call *Comets*.

COMITATU *ex Castro Commissio*, is a Writ whereby the Charge of a County, together with the keeping of a Castle, is committed to the Sheriff.

COMITATU *Commissio*, is a Writ or Commission, whereby the Sheriff is authoris'd to take upon him the Command of the County.

COMITIALIS *Morbus*, the same with *Epilepsia*.

COMMA, is one of the Points or Stops used in Writing, and is thus mark'd (,) and is the least in Power of them all, implying only a small Rest or little Pause, without breaking off the Sentence.

COMMA, in Musick, is the Ninth Part of a Tone, or the Interval whereby a Semi-tone or a perfect Tone exceeds the Imperfect. This Term is used only in Theoretical Musick, to shew the exact Proportion between Concords.

COMMANDING Ground, in Fortification, is such as overlooks any Post or strong Place : Of this they reckon 3 sorts ; 1. *A Front Commanding Ground*, which is an Height opposit to the Face of the Post which plays upon its Front. 2. *A Reverse Commanding Ground*, which is an Eminence that can play upon the Back of any Place or Post. 3. *An Enfilade Commanding Ground*, or *Curtain Commanding Ground*, which is an high Place that can with its Shot scour all the Length of a strait Line.

COMMENDAM, is a Benefice that being void, is commended to the Care of some sufficient Clerk, to be supplied till it may conveniently be provided of a Minister. He to whom the Church is commended hath the Fruits and Profits thereof only for a certain time, and the Nature of the Church is not changed thereby, but is as a thing deposited in the Hands of him to whom it is commended who hath nothing but the Custody thereof which may be revoked. When a Parson is made a Bishop, there is a *Cession* of his Benefice by the Promotion ; but the King may give him a Power to hold it in *Commendam*.

COMMENSURABLE *Magnitudes*, are such as are measured by one and the same common Measure ; as *A* and *B* by *C* ;

<i>A</i>	— — — — — —
<i>B</i>	— — — — — —
<i>C</i>	— — — — — —

for *C* repeated 6 times, measures *A* ; and repeated 3 times, measures *B* ; therefore *A* and *B* are said to be *Commensurable*. Def. 1, 2, *Eucl.* 10. c. 6. *Euclid*.

COMMENSURABLE Numbers, whether Integers or Fractions, are such as have some other Number which will measure or divide them without any Remainder : Thus 6 and 8, $\frac{8}{5}$ and $\frac{3}{4}$ are respectively *Commensurable Numbers*.

COMMENSURABLE in Power : Right Lines are said to be *Commensurable in Power*, when their Squares are measured by one and the same Space or Superficies. Def. 3. c. 10. *Eucl*.

COMMENSURABLE *Surds*, are such *Surds* as being reduced to their least Terms, become true Figurative Quantities of their kind ; and are therefore as a Rational Quantity to a Rational.

COMMUNITION, is a dividing of a thing into very small Parts or Particles.

COMMISSARY : In an Army there are two sorts of Commissaries, 1. The *Commissary General of the Musters*, or *Muster-master General*, who takes an Account of the Strength of every Regiment, reviews them, sees that the Horse be well mounted, and all Men well armed and accounted. 2. The *Commissary General of Provisions*, who hath the Charge of furnishing the Army with all things of that kind.

COMMISSURES, a Word used frequently by Mr. Boyle and others for the small Pores of any Body, or the little Clefts, Cavities or Interstices which are between the Particles of any Body ; especially when the Particles are broadish and flatish, and lie contiguous to one another, like very thin Plates.

COMMON *Axis*, in *Opricks* : See *Axis*.

COMMON Divisor, is that Number which exactly divides any two other Numbers, without leaving any Remainder.

COMMON-PLEAS, is the King's Court now held in *Westminster-Hall*: all Civil Causes, both Real and Personal are, or were, in former times, try'd in this Court according to the strict Law of the Realm. The Chief Judge of that Court is called *The Lord Chief Justice of the Common-Pleas*, assisted with three or four Associates, which are created by Letters Patents from the King, and as it were installed or placed upon the Bench by the Lord Chancellor and Lord Chief Justice of the Court. *Forrescue*, cap. 51. The rest of the Officers belonging to this Court are the *Custos Brevisium*, three Protonotaries, one Chirographer, fourteen Filicers, four Exigenters, Clerk of the Warrants, Clerk of the Juries, or *Jurata Writs*; Clerk of the King's Silver, Clerk of the Treasury, Clerk of the Escoyons, Clerk of the Outlawries; whose distinct Functions see in their proper places.

COMMON Ray, in *Opticks*, is a Right Line drawn from the Point of Concourse of the two Optical Axes through the Middle of the Right Line which passes by the Center of the Pupil of the Eye.

COMMON Receptacle, in Anatomy, is a certain Vessel, so termed, because it receives both the *Chyle* and *Lympha* promiscuously, though some falsely call it the *Receptacle* of the *Chyle* in particular.

Common Section of two Planes: See *Section*.

COMMON Sensory, the common Perception of all Sensations, or that which receives the Images of sensible things, or the Impression made by the Objects upon the Nerves, and according to these Implies determines the Appetite and exerts other Animal Actions.

COMMUNI Custodia, was a Writ that lay for that Lord, whose Tenant, holding by Knight-service, dies, and leaves his eldest Son under Age, against a Stranger that entrench the Land, and obtaineth the Ward of the Body: But now is become of no use.

COMMUNIA Placita non tenenda in Scaccaria, is a Writ directed to the *Treasurer* and *Barons of the Exchequer*, forbidding them to hold Plea between two Common Persons in that Court, where neither of them belong to it.

COMPARATIVE Degree, in Grammar, is when an Adjective hath joined to its natural and ordinary Signification the Word *more*, either actually or implied; as *more wise*, or *worse*, that is, *more bad*.

COMPARISON, in Grammar, is the Variation of the Sense of an Adjective, as to Degree; as *good*, *better*, *best*, are the three Degrees of Comparison of that word.

COMPARTIMENT, is a regular orderly disposition of agreeable Figures all round any Picture, Map, Draught, &c. for its better Ornament.

COMPASS, in Navigation, is a Circle divided into four Quadrants, representing the four Cardinal Winds, or Principal Points, *East*, *West*, *North*, and *South*; and each Quarter subdivided into eight other equal Parts, making in all 32 *Rhumbs* or *Points*.

This thus graduated Circle being drawn on a Chard, or Past-board, hath a toucht Needle or Wire placed under it, and in its Center a Brass little Cell or a Conical Hollow, by which means it

hangs horizontally on an erect Pin, and keeps its Lilly or North-Point always towards the *North*; by which means the Man at Helm, or Steersman knows how to keep the Ship to her Course.



This Instrument, though it be subject to Accident, and always to Variation, is yet of vast use in Navigation; as also in Surveying, Dialling, and many other Parts of the *Mathematicks*.

The Learned Dr. Wallis conjectures, That the Compass was invented by an *Englishman*, because the word *Compass* is used in many parts of *England* for a Circle.

COMPASS Dials, are small ones fitted in Boxes for the Pocket, and shew the Hour of the Day by the Direction of the Needle; which shews how to place them right, by turning the Dial about till the Cock or Stile stand directly over the Needle, and point up to the Northward; but these can never be very exact, because of the Variation of the Needle itself.

COMPASS of Proportion, is an Instrument to divide Lines and Circles into proportional Parts at one opening of the Compasses, and is very much used in reducing or enlarging of Maps or Draughts. The French sometimes call a *Settor* by this Name the *Compass of Proportion*.

COMPERTORIUM, a Judicial Inquest in the Civil-Law, made by Delegates or Commissioners to find out, or relate the Truth of a Cause.

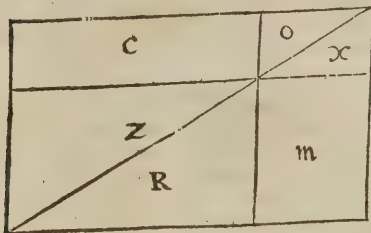
COMPLEMENT of any Ark of a Circle, or of any Angle, is what it wants of a Quadrant or 90 Degrees.

COMPLEMENT of the Course, in Navigation, is the Number of Points the Course wants of 90 Degrees, or eight Points, viz. of a Quarter of the Compass.

COMPLEMENT of the Curtain, in Fortification, is that part of the Curtain which (being wanting) is the *Demigorge*.

COMPLEMENT of the Line of Defence, is the Remainder of the Line of Defence after you have taken away the Angle of the Flank.

COMPLEMENTS in a Parallelogram, are the two lesser Parallelograms C and M, which are made by drawing two Right Lines parallel to each side of the Figure, through a given Point in the Diagonal.



Proposition.

In every Parallelogram the Complements C and M are equal : For $Z + C + O = R + M + X$, as making up on each side the great Triangle, made = by the Diagonal ; of which $Z = R$ and $O = X$ (because the Diagonal makes them so) wherefore the remaining Parallelogram $C = M$. *Q. E. D.*

COMPLEX Terms, in Logick, are such as are compounded of simple or single ones ; which they call *Incomplex Terms*.

COMPLEX, or *Complicated Diseases* : See *Complication*.

COMPLEXUS, a Muscle of the Head, serving to move it backwards. It is also called *Trigeminum*, because it hath plainly a three-fold Beginning, and seems to be compounded of 3 Muscles ; one Beginning is from the tranverse Processes of the fourth and fifth *Vertebrae* of the Thorax : The Second from the first and second of those *Vertebrae* ; and the Third from the Spine of the 7th *Vertebra* of the Neck : After, in their Ascent, they all unite together, and are inserted into the *Occiput*, sometimes by one, and sometimes by a threefold Tendon.

COMPLICATION of Diseases, is when divers Distempers seize on the Body at the same time, especially if they depend one upon another.

COMPOSITA, or *Compound Medicines*, are Medicines made up of any Simple Medicines ; as certain Waters, Syrups, Electuaries, Opiates, Trochisks, Ointments, Plasters, &c.

COMPOSITE Order, in Architecture, which is also called *Italic* and *Roman*, because it was the Invention of the Ancient Romans, is so called, because it is composed of the other four Orders, viz. *Tuscan*, *Dorick*, *Ionick*, and *Corinthian* ; the first is composed only of the *Ionick* and *Corinthian*.

COMPOSITON, in Painting, is used in the same Sense with *Invention* or *Design* ; See *Design*. There is also a certain Method of Demonstration in Mathematicks call'd by this Name of,

COMPOSITION, which is the Reverse of the Analytical Method, or of *Resolution* : It proceeds upon Principles in themselves self-evident, on *Definitions*, *Postulates*, and *Axioms*, and a previously demonstrated Series of Propositions, step by step, till it give you a clear knowledge of the thing to be demonstrated. This is what they call the *Synthetical Method*, and is used by *Euclid* in his *Elements*.

COMPOSITION of Motion, is the Composition of the several Directions or Declivities of Motion, whether equable or unequable.

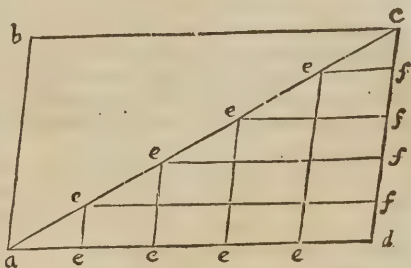
If any Point be supposed to move or flow (for this Speculation gives an Illustration of the Do-

ctrine of *Fluxions*) according to one and the same Direction ; whether it move equably or not, whether it be accelerated or retarded in any Proportion whatsoever, it will still keep the same Right Line, only the *Celerity* will be changed, and will be increased or diminished according to the Forces, with which it is impelled.

Nay, if the Motion be so compounded as that the Directions be made one quite contrary to the other, as one suppose directly downward, the other upward, &c. yet still the Line of Motion will be the same.

But if the Compounding Motions are not according to the same Line of Direction, but such as do intersect each other, then the Compound Motion will not be according to the Line of Direction of either of the former, but in a different one from them both ; and this either straight or crooked, according as the Directions and Celerities shall require.

If two Compounding Motions be each of them equable (or every where equally swift) whether the Celerity of those Compound Motions be each to other equal or unequal, yet the Line of the Compound Motion will still be a straight Line ; and this, though the Motion be neither at Right Angles one to another, nor equally swift, nor (each to it self) equable, if they be at least but *Similar*, that is, if they be both accelerated and retarded alike.



Thus, for instance, if the Point a be impelled by a double impulse of equal force, both upwards towards b , and also forwards towards d , 'tis plain, that when it is gone forwards as far as ee , it must of necessity be gone upwards as far ef ; and if the Motions were both equable, it would always go on in the Diagonal ac .

Nay, if the Motions be unequal as to Celerity, so as, v. gr. it move twice as fast upward as forward, &c. yet still it must go on in the Diagonal ac , because the Triangles ae , ae , ec , &c. and ad will still be *Similar*, being as the Motions are : But if the Motions be *Dissimilar*, then the Compound Motion must be a *Curve*.

And this Consideration of the Composition of Motions is of great use in Mechanics. See *Diston's Law of Motion*.

COMPOSITION of Proportion, the comparing the Sum of the Antecedent and Consequent with the Consequent in two equal Ratio's, as suppose 4. 8 :: 3. 6. they say by Composition of Proportion, 12. 8 :: as 9. to 6. But,

There is, as *Dr. Wallis* well distinguishes it in his *Algebra* (*Engl. Ed.* p. 85.) a great difference between Composition of Proportion by Addition, and by Multiplication ; the Instance above is of

Com-

Composition by addition; but if it had been 4×8 it would have been Composition by Multiplication. In one word, Composition of Proportion by Addition, is by Addition of the *Indices* of the *Ratio's*, but by Multiplication, it is when the *Ratio's* are multiplied into one another. See more of this Matter under the Word *Proportion*.

COMPOSSIBLE, is an old barbarous Word used to signify such things as are capable of existing together, whereas such as cannot exist together are called *impossible things*.

COMPOUND Interest, are those which some Number may measure besides Unity; as 15, which is measured by five and three.

COMPOUND Quantities, in Algebra, are such as are connected together by the Signs $+$ and $-$, and are expressed by the same Letters than one, or else by the same Letters unqually repeated; thus, $a + b = c$, and $b b - b$ are Compound Quantities.

CONPOUNDED, Composite, or Aggregated Flower of a Plant, is by the Botanists accounted such an one as consists of many little Flowers concurring together to make up one whole one, each of which hath its *Style* and *Stamina*, and adhering Seed, and are all contain'd within one and the same *Calyx* or *Perianthium*. This Composite Flower distinguishes a large Genus of Plants, which our Accurate Botanist, Mr. Ray, divides as follows:

Herbs of Compounded or Aggregated Flowers are,

1. Such as have a plain Leav'd Flower naturally, and for the most part full, and having their whole Body Milky (*i. e.* on cutting or cropping yielding a Milky Juice) and these have [their Seeds.

1. Pappous or Winged, *i. e.* having a little Lannugo adhering to each Seed, by which the Wind can carry it easily from place to place: Such as the *Lactuca*, *Tragopogon*, *Scorzonera*, *Dens Leonis*, *Hieracium*, and the *Pilosella*.

2. Such as the solid Seed without any Pappous or Down upon them; as the *Eringium*, *Luteum*, *Cichorium*, *Lampfana*.

2. Such as have a Discous Flower, that is, one composed of many short, thick, compressed, small *Flosculi* (which some by mistake call *Stamina*) set together so as to make one flat or hollowish Superficies: And these also either are such as have their Seeds,

Pappous, as the *Tussilago*, *Petasites*, *Carlina*, *Helianthemum*, *Doronicum*, *Conyza*, *Asier*, *vinga Aurea*, *Jacobaea*, *Stachys Citrini*, *Jacea*, *Senecio*, *Eupatorium Avicennae*, *Cacalia Valgaris*, *Gnaphalium Maritimum*, and *Monspeliensium*.

Such whose Seeds are Solid and not Pappous, as the *Corymbiferous Herbs*; which see under that Word.

COMPULSION, is when in an Agent capable of Volition, the Beginning or Continuation of any Action is contrary to the Preference of his Mind.

COMPUTO, is a Writ so called of the Effect, because it compelleth a Bailiff, Receiver, or Cham-

berlain to yield up his Accounts: It lieth also for Executors of Executors; and against the Guardian in Socage, for Waste made in the Minority of the Heir.

CONARIUM, or the *Glandula Pinealis*, is a part of the Brain hanging in a small Cavity called the *Anus* in the hinder part of the third Ventricle of the Brain, and leading into the fourth; it is so called from being of the Shape of a Pine Cone. *Des Cartes* supposed this Glandule to be the Seat of the Rational Soul; but its Substance being the same with the rest of the Brain, its probable it serves for the same Use.

CONATUS *Recedendi ab Axe motus*, is the Endeavour which any Body moved circularly hath to recede or fly off from the Center or Axis of its Motion.

CONCATENATION of Causes, is a Term sometimes used to express, that an Effect is the Result of a long Chain of Causes depending upon or linked one to another.

CONCAVE and Concavity, signifies the Hollowness of any thing: See *Convexity*.

CONCAVE Glasses, are such as are ground hollow, and are usually of a Spherical Figure, though they may be of any other; as *Parabolical*, &c.

All Objects seen through Concave Glasses appear erect and diminished or lessened.

What the Virtual Focus of a Concave Glass is, see under that Term.

The confused Appearance of a Point through any Concave Glass proceeds from the too great Divergence of those Rays which fell on the Eye; wherefore, because the more remote the Eye is from the Glass, the less will the Rays Diverge; therefore the farther the Eye is from a Concave Glass, the more distinct will be the Appearance of any Object thro' it, tho' the more faint.

The Apparent Place of Objects seen through Concaves, is always brought nearer to the Eye; which is the Reason why they help Short-sighted Persons, or such as can see only nigh Objects distinctly.

For a Rule to fit a Concave Glass to the Eye of such a Person, let him observe nicely the Distance at which he can read Letters, or see Objects distinctly; which suppose to be at 12 Foot, then will a Concave Glass, whose Virtual Focus is a Foot distant from it, make that Person see distant Objects distinctly.

The farther the Eye is removed from any Concave Glass the less the Object appears, and a lesser Area of it is seen; and when the Glass is exactly in the Middle between the Eye and the Object, the Object will appear the most diminished, that that Distance between the Eye and Object will allow of.

CONCENTRATION, according to Dr. Grew, is the highest Degree of Mixture, and is when two or more Atoms or Particles of the Mixture do touch by Reception and Intrusion of one into the other: And this he takes to be the Case of all fixed Bodies which are without Taste or Smell, whose Constitution is so firm, that till the Particles are as it were unprim'd from each other, they cannot affect either of those Senses.

CONCENTRICK Figures, are such as have the same common Center.

CONCEPTIO, a Grammatical Figure: See *Syllepsis*.

with all their Octaves : *Imperfect Conords* are the Third and Sixth with their Octaves. The *Imperfect* have yet another *Distinction*, viz. the Greater and Lesser Third, as also the Greater and Lesser Sixth. Some reckon the *Unison* among the *Concords*, but others will not admit it into the Number of the Intervals.

CONCRETE, is the Subject in which any Qualities inhere : See *Abstract*.

CONCRETE, in Natural Philosophy and Chymistry, signifies a Body made up of different Principles, and therefore is of much the same signification as the Word *Mix'd* : Thus *Soap* is a *Fatitious Concrete*, or a Body mix'd together by Art ; and *Antimony* is a *Natural Concrete*, or a mix'd Body compounded in the Bowels of the Earth.

CONCRETE, is also used in Logick in Contradistinction to the Word *Abstract*, v. gr. when we consider any Quality, as Whiteness, inhering in any Subject, as suppose in *Snow*, if we say the *Snow is White*, then we speak of Whiteness in the *Concrete* ; but if we consider Whiteness by it self as a Quality that may be in Paper, in Ivory and in other things as well as *Snow*, we are then said to consider or to take it the *Abstract*.

CONCRETE Numbers, are those which are applied to express or denote any particular Subject, as 2 Men, 3 Pounds, $\frac{3}{4}$ of a Shilling, &c. whereas if nothing be connected with the Number, 'tis taken abstractly or universally : This 3 signifies only an Aggregate of 3 Unities, let those Unities be Men, Pounds, or what you please.

CONCRETION, is the uniting together of several small Particles of a Natural Body into sensible Masses or *Concrete*, whereby it becomes so and so figured and determined, and is indued with such and such Properties.

CONCURRING, or *Congruent Figures*, in Geometry, are such as being laid one upon another, will exactly meet and cover one another ; and therefore 'tis a received Axiom in reference to Plane or Superficial Figures, *Quod quæ sibi mutuo congruunt sunt equalia* ; i. e. Those Figures which will exactly cover one another are equal.

CONE or *Conn*, in the Sea Phrase, is to guide or conduct a Ship in her right Course : He that Conns stands aloft with a Compass before him, and gives the Word of Direction to the Man at Helm how to Steer.

If the Ship go before the Wind ; or as they call it, *betwixt the Sheets*, then the word is, *Star-board*, or *Port the Helm* (according to the Conder, would have the Helm put to the Right or Left Side of the Ship) and then the Ship will always go the contrary way. If he says, *Helm a Mid-ship*, he would have the Ship go right before the Wind, or directly between her two Sheets. If the Ship Sail by a Wind, or on a Quarter Wind, the Word is, *A-loof ! Keep your Luff ! Fall not off ! Veer no more ! Keep her to ! Touch the Wind ! Have a care of the Lee-Latch !* All which Expressions are of the same import, and only imply, that the Steersman should keep the Ship near the Wind. On the contrary, if he would have her Sail more large, or more before the Wind, the Word is, *Ease the Helm ! No near ! Hear up !* But if he cries *Steady !* It means no more than *Keep her from going in and out*, or *Making Yaws* (as they call it) howsoever the Sails, whether large by a Wind ; and when he would have her go just as she doth, he cries, *Keep her thus ! Thus, &c.*

CONDENSANTIA : See *Incrustantia*.

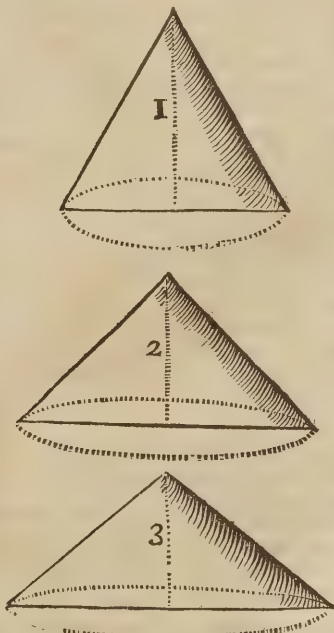
CONDENSATION of any Natural Body, is when it takes up less Space, or is confined within less Dimensions than it was before.

CONDITIONAL Propositions, are such as have two parts bound together by the Conditional Particle (*if*) of which the first, where the Condition lies, is called the *Antecedent*, and the other the *Consequence* : Thus, *If the Soul be Spiritual, it is Immortal*, is a Conditional Proposition, wherein *If the Soul be Spiritual*, is the *Antecedent* ; *it is Immortal*, is the *Consequent*.

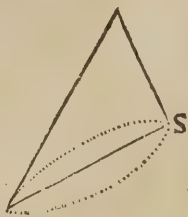
CONDYLL, are the Joints and Knuckles of the Fingers.

CONDYLOMIA, is the knitting or jointing of the Joints of an Animal Body : Also a certain Tumour in the little Skin of the Fundament ; an hard and callous Swelling growing from black Humours that Flow thicker, and rather troublesome than painful. Sometimes also it is accompanied with an Inflammation. *Blanchard*.

CONE, is a solid Figure, whose Base is a Circle, and is produced by the Revolution of the Plane of a Right-angled Triangle round the Perpendicular Leg ; which Leg (or *Axis*) if it be equal to the Base, the Solid produced is an *Acute-angled Cone* (as 2.) if it be less, it is an *Acute-angled Cone* ; but when greater, an *Obtuse-angled Cone*.



A Cone is said also to be Right as to the Position of its Axis in respect to the Horizon; i. e. when its Axis be not so, 'tis called an *Oblique Cone*. A Cone is called *Scalenous*, when one Side of it is longer than the other, as S.



The solid Content of a Cone is found by multiplying the Area of its Base by $\frac{1}{3}$ of its perpendicular Height.

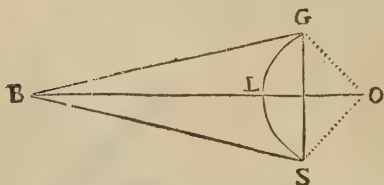
For a Cone is but a Pyramid of infinite Sides, and a Pyramid is equal to $\frac{1}{3}$ of its circumscribing Prism, and a Prism is but a Cylinder, having an infinite Number of Sides; therefore a Cone is equal to $\frac{1}{3}$ of a Cylinder circumscribing it. 7. c. 12. Euclid.

See also the Demonstration under Proportion of Solids.

How to find the External Surface of a Cone, see under the Word Pyramid.

If a Cylinder, Sphere and Cone have the same Base and Altitude, the Cone is the Difference of the Cylinder above the sphere; and Cylinder, Sphere and Cone, are as 3, 2 and 1. See Cylinder.

CONE of Rays, in Opticks, are all those Rays which fall from any Point, as suppose B, in any Ob-



ject, on whose Surface of any Glass, as GLS, having Vertex in B, and the Glass for its Base; such is the Cone GLSB.

CONFECTIONS, a Composition of Powders, Gums, Sugar, Honey, Syrups, &c. made up into one Substance; and it is two-fold, either dry, as *Loxenges*, &c. or moist, as *Preserves*, *Conerves*, and all sorts of *Amidoses*. Blanchard.

CONFISCATE, in Law, signifies to be forfeited to the Publick Fisque or King's Treasury: For among the Romans the Emperor's Treasure was kept in Hampers or Baskets, which, in Latin, is *Fiscus*. Now if a Man be Indicted for Feloniously stealing the Goods of another, tho' in truth they are the proper Goods of the Person Indicted, yet if, when the Goods are brought in Court against him, as the Manner is, he shall then *Disclaim* them, he doth by this *Disclaimure* lose the Goods, although he be afterwards acquitted of the Felony, and they shall be *Confiscated* to the King; but it is otherwise if he does not Disclaim them. The same

Law is where Goods are found in the Felon's Possession, which he disavows, and afterwards is attained of other Goods, and not of them, there the Goods which he disavows are *Confiscated* to the King; but had he been attained of the same Goods, they should have been said to be *Forfeited*, and not *Confiscated*, notwithstanding the Disavowment. So if an Appeal of Robbery be brought, and the Plaintiff leaves out some of his Goods, he shall not be received to enlarge his Appeal; and forasmuch as there's none to have the Goods so left out, the King shall have them as *Confiscate*, according to the old Rule, *Quod non capit Christus, capit Fiscus*.

CONFUSED Vision: See Vision.

CONGE, a Term in Architecture: See Apophyge.

CONGEALE, in Chymistry, is to let some Matter that is melted fix or grow into a Consistency; as when a Metal is left to cool, which hath been melted in a Crucible; or when Wax, Fat, Butter, or the like, are taken from the Fire and set to cool, they say, 'tis let *Congeal*.

CONGLOBATE, a Word used for such of the Glands in an Animal Body as are smooth in their Surface, and seem to be made up of one continued Substance: They serve to separate the Lympha from the Arterious Blood, and to return it by the Lympheducts, either into the Chyliferous or Sanguiferous Vessels, though some think the Glands of the Mesentary, and Breasts of Lactescent Women serve to separate true Chyle.

CONGLOMERATE Glands, are such in an Animal Body as are uneven in the Surface, and are made up, as it were, of many lesser Glands. Their Use in the Body is to separate several sorts of Juices from the Blood, and also to Elaborate and alter them, and by proper Ducts to convey them to their appropriate Receptacles and Cavities. Thus the *Parotides* and Maxillary Glands separate and bring the Saliva into the Mouth by their proper Ducts.

CONGREGATION, according to Dr. Grew, is the least Degree of Mixture; in which the Parts of the Mixt are *inconsistent*, and do touch each other but in a Point; and he saith, he hath many Arguments to induce him to believe, that the Atoms or Particles of all Fluids, as such, do touch one another only after that Manner.

CONGRUITY, by the Naturalists is esteemed a Relative Property to a Fluid Body, whereby any Part of it is readily united with any other Part, either of it self, or of any other Similar Fluid or Solid Body. And *Incongruity* is a Property by which it is hindered from uniting with any Solid or Fluid Body dissimilar to it.

CONGRUITY of Geometrical Figures: See Concurring.

CONICK Sessions: See Sessions.

CONJERIES, is the joining or collection together of many Bodies or Particles in Mass or Lump.

CONIFEROUS Plants, whether Trees, Shrubs or Herbs, are such as bear a Squammose Scaly Fruit, of a Woody Substance, and of a kind of Conical Figure, in which Cone are many Seeds, and when they are ripe, the several Cells or Partitions in the Cone gape or open, and the Seed drops out: Of this kind are the Scotch Firs, Male and Female, and the Pine, which in our Gardens is called

called the *Scotch Firr*, the common Alder, and the Beech Tree.

CONJUNCTIVA Tunica, the same with *Adnata*.

CONJUGATE Diameter, is the shortest Axis or Diameter in an Ellipsis.

CONJUGATE of the *Hyperbola*, is a Line drawn parallel to the *Ordinates*, and thro' the Center or middle Point of the *Transverse Axis*; and is always a middle Proportion between the *Parameter* (or *Latus Rectum*) and the *Latus Transversum*. This Line also is sometimes called the *Second Axis* or *Diameter*.

CONJUGATION of a Verb, in Grammar, is varying or forming it by Mood, Tense and Person.

CONJUNCTION, in Astronomy, is the meeting of the Stars or Planets in the same Degree of the Zodiac; and is either *Apparent* or *True*.

CONJUNCTION *Apparent*, is when the Right Line that is supposed to be drawn thro' the Centers of the two Planets, does not pass thro' the Center of the Earth.

CONJUNCTION *True*, is when that Right Line being prolonged, passes also thro' the Center of the Earth.

CONJUNCTION, in Grammar, is an undecidable Word, which is used to connect or join Words and Sentences together.

CONNIVENTES Glandule, are those Wrinkles which are found in the Inside of the *Intestinum Ileum* and *Jejunum*. For the inner Tunick of the Guts being longer than the Middle or the Outward, it doth frequently, and in many Places wrinkle or bag out, by which Means the Passages for the Contents become strait'ned, and consequently the Matter descends thro' the Guts more slowly, so that the *Lacteals* have the more time to imbibe Chyle.

CONOID, is a Solid produced by the Circumvolution of any Section of the *Cone* about its *Ax*, and may be either a

CONOID *Epileptical*, when made by an *Ellipsis*, and then is more commonly called a *Spheroid*; and if the Revolution be made round the *Latus Transversum*, it forms an oblong *Spheroid*; but if round the *Conjugate Axis*, a *Prolate* or *Oblate one*: Such is the Figure of our Globe, and of the other Planets.

CONOID *Hyperbolical*, when made by an *Hyperbola*.

CONOID *Parabolical*, when it is produced by the Section called a *Parabola* turning about its *Ax*.

CONOIDES, the same *Conarium*.

CONSCRIBED, the same with *Circumscribed*: Which see.

CONSECTARY, is a Deduction or a Consequence drawn from a preceding Proposition, and is the same with *Corollary*.

CONSENT (in Medicine) is the depending of one Distemper upon another: Thus a Difficulty of Breathing is said to proceed by *Consent* from a *Pleurisy*, and in that Case does not require a particular Cure, because it ceases as soon as the Disease on which it depends is removed; or the mutual Sympathy or Correspondency betwixt the Parts of the Body, which is usually said to be occasioned.

1. By the Likeness or Similitude of their Kind, as when one Nerve is affected with the Hurt of another.
2. By the Similitude of their Office or Function, as when the Intercoastal Muscles suffer

by an Inflammation of the Diaphragm. 3. By a Communication of Vessels, for which Reason a Fit of the Stone in the Kidneys is frequently attended with Vomiting. 4. By the Contiguity or Neighbourhood of the Parts, as when the Inflammation of the Pleura is communicated to the *Lungs*: But the two former may be reduced to the two latter, which are the only real Causes of a *Consent* or Sympathy betwixt the Parts of the Body.

CONSEQUENCE or *Consequentia*, a Term in Astronomy: See *Antecedence*.

CONSEQUENT, in Mathematicks, is the latter of two Terms of Proportion, as if the Proportion were of *A* to *B*, *B* is said to be the *Consequent*.

CONSERVA, a *Conserve*, is a Composition of Flowers or Herbs beat together, to every Pound whereof, if they be dry, are added three Pounds of Sugar; if moister two Pounds, so that they may be kept several Years. *Blanchard*.

CONSISTENT Bodies, so Mr. Boyle calls such as we usually stile solid or firm ones, and he means such whose Parts are firmly and consistently united together, so that they do not slide over one another's Surfaces, as easily as the Parts of Fluid Bodies do.

CONSOLE, is a kind of Bracket or Shoulder-ing-Piece in Building, which hath a Projecture, and serves to support a Cornice, or to bear up Figures, Butts, Vessels, and other Ornaments of the like Nature.

CONSOLIDATING Remedies, are those things which cleansing with a moderate Heat and Force, by taking Corruption out of Wounds, and preserving the Temperature of the Parts, cause the Nourishment to be fitly apply'd to the Part afflicted. *Blanchard*.

CONSOLIDATION, is a Word used by Physicians and Surgeons for the uniting strongly together the Fractures of broken Bones, or the Lips of a Wound; then they say the Parts begin to consolidate or join together in one entire Piece, as they were before the *Fracture* or the *Solution of Continuity*.

CONSONANCE, in Musick, is the Agreement of two Sounds, the one *Grave*, the other *Acute*, which are compounded together by such a Proportion of each, as shall prove agreeable to the Ear. A *Unison* is the First *Consonance*, an *Eight* is the Second, the *Fifth* is the Third, and then follows the *Fourth*, and the *Third* and *Sixths*, major and minor. There are other *Consonances*, which are the Doubles or other Repetitions of the former. There can be but Seven or Eight *Simple Consonances*; the *Perfect* ones are the *Unison*, the *Eight* and the *Fifth*, with their Correspondents.

CONSPIRATIONE, is a Writ that lies against Conspirators.

CONSTABLE, is a Word variously used in our Common-Law: First, for the *Constable of England*, who is also called *Marshal*; his Office consisteth in the Care of the common Peace of the Land in Deeds of Arms and Matters of War. The Court of the *Constable* and *Marshal* determineth Contracts touching Deeds of Arms out of the Realm, and handling things concerning War within the Realm, as Combats, Blazons of Armory, &c. But he may not deal with Battel in Appeals, nor, generally, with any other thing that may be tried by the Laws of the Land. Out of his Magistracy were drawn these lower *Constables* which

we call *Constables of Hundreds and Franchises*, and first ordained by the Statute of *Winchester*, which appointed for the Conservation of Peace and View of Armour two *Constables* in every Hundred and Franchise: And these be now *High Constables*, because continuance of Time and increase of People and Offences, hath again, under these, made others in every Town called *Petit Constables*, which are in like Nature, but of inferior Authority to the other. Besides these there be Officers of particular Places called by this Name, as *Constable of the Tower*, *Constable of the Exchequer*, *Constable of Dover Castle*, &c.

CONSTAT, is a sort of Certificate made by the Clerk of the Pipe and Auditors of the *Exchequer*, at the Request of any Person who intends to plead in that Court for the Discharge of any thing.

CONSTELLATION, or *Asterism*, is a Company of fixed Stars, imagined to represent the Image of something, and commonly called by the Name of that Thing: There are 21 Northern and 12 Southern ones.

CONSTIPATION, is when the Parts of any Body acquire a closer Texture than what they had before.

CONSTITUTIONIS *Basilick*: See *Basilick Constitutions*.

CONSTRUCTION, is the crouding the Parts of any Body close together in order to Condensation.

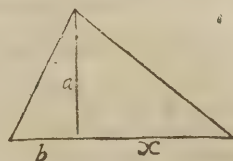
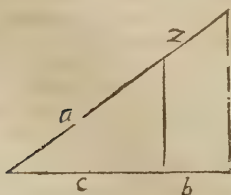
CONSTRUCTOR *Labiorum*, *Sphincter* & *Orbicularis Labiorum*, a Muscle which environs the Lips with Orbicular Fibres, and when it acts it purles them up; wherefore some Name it *Osculatorius*.

CONSTRICTORES *Alarum Nasi ac Depressores Labii Superioris*: These Muscles arise from the fourth Bone of the upper Jaw, immediately above the Gums of the *Dentes Incisorii*, and ascending, are soon inferted to the Roots of the *Ale Nasi* and superior Parts of the upper Lip; they draw the upper Lip and *Ale* downwards.

CONSTRUCTION of Equations, in Algebra, is the contriving such Lines and Figures as shall demonstrate the Equation, Canon or Theorem to be true Geometrically. And this is often of great Use to solve and illustrate Algebraical Equations: And the Manner of it you will see in the following Rules, which shew you how to resolve Simple Equations into Proportionals, and to build a Geometrical Construction thereupon.

1. Thus if $\frac{ab}{c} = x$, then $c : b :: a : x$; by 12. e. 6. *Euclid*.

Or if $\frac{aa}{b} = x$, then $b : a :: a : x$.



Or if $\frac{ab+ag}{b+i} = x$, then $b+i : b+g :: a : x$.

Or if $\frac{ab+ag}{b+i} = x$, then $b-i : b+g :: a : x$.

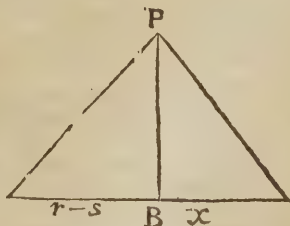
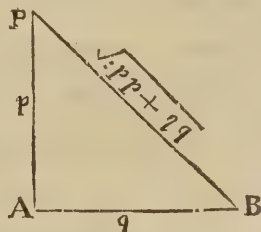
2. If $\frac{ab+mn}{r-s} = x$, the Construction and So-

lution will be more difficult, because no Letter in the Numerator is taken twice; but that it may be so, and that (*a*) (for Instance) may be twice us'd, make, as $a : n :: m : a$ to a Fourth Proportional, which call *p*; then $nm = ap$, and consequently, $\frac{ab+ap}{r+s} = x$; wherefore, by Rule 1, $r+s : b+p :: a : x$.

Or if this Equation were proposed, $\frac{ab+m}{r-s} = x$,

first find a mean Proportional between *a* and *b*, which suppose to be *p*; also another mean Proportional between *m* and *n*, which let be *q*; then the Equation will stand thus, $\frac{pp+qq}{r-s} = x$.

Let therefore a Right-angular Triangle be made, wherein the Perpendicular $AP = p$, and the Base $AB = q$; therefore shall $PB^2 = pp + qq$, which, since according to the Equation it is to be divided by $r-s$, make, as $r-s : PB (= \sqrt{pp+qq}) ::$

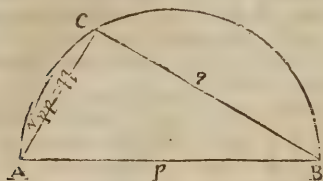


PB : to a Third Proportional, and that shall be *x* sought.

3. In this Equation $\frac{ab-mn}{c+d} = y$.

First, Make, as $a : m :: n : p$, a Fourth Proportional;

portional; then will $\frac{ab - ap}{c + d} = y$, and consequently (as in *Case 3.*) $c + d : b - p :: a : y$.



Or you might (as in *Case 2.*) have found a mean Proportional between a and b , as also between m and n , which being called (as there) p and q , the Equation would have stood thus, $\frac{p \cdot p - q \cdot q}{c + d} = y$: Then having taken $AB = p$, and on it, as a Diameter, drawn a Semicircle, and applying in $BC = q$, the Square of AC will be $= pp - qq$; which, since it is to be divided by $c + d$, make, as $c + d : AC :: AC : y$, the Quantity sought.

4. Let this Equation $\frac{a a b c}{f f g} = z$ be proposed :

First, Find out (p) a Third Proportional to f and a , then $fp = aa$; the Equation will stand thus, $\frac{f p b c}{f f g} = z$, that is, $\frac{p b c}{f g} = z$.

Secondly, Find a Fourth Proportional (q) to f , p and b , saying, as $f : p :: b : q$; then will $f q = p b$, and consequently the Equation will stand thus, $\frac{f q}{g} = z$, that is, $\frac{q}{g} = z$; and therefore (as Rule 1.) $g : q :: c : z$, sought.

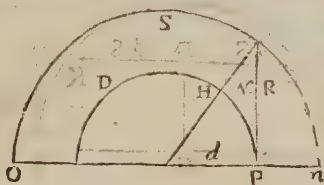
5. If this Equation $\frac{h k k}{m m} = z$ were proposed,

First, Find a Fourth Proportional to m , b and k , which let it be p ; therefore $p m = b k$, and consequently the Equation will stand thus, $\frac{p m k}{m m} = x = \frac{p k}{m}$; therefore $m : p :: k : x$, sought.

Construction of all the Three Forms of *Quadratic Equations*, according to Mr. *Oughtred's* Method of Solution.

Draw two Concentrick Circles, as in the Figure, and let the Diameter of the Greater be called S , and the Diameter of the Lesser be D .

Which Letters S and D do represent the Sum and Difference of the Roots found, as H and d do the Half Sum and Half Difference.



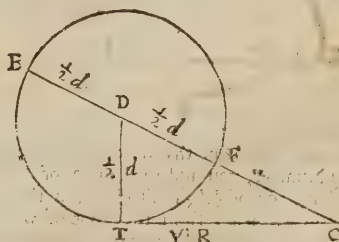
Since therefore his Theorem is, that $SS - DD = 4R$, let \sqrt{R} be made a Tangent to the lesser Circle, and a Right Sine in the Greater, and draw the Hypotenuse H , and call the Base of the Triangle d .

Then will $HH - dd = R$, (viz. $\frac{1}{4}SS \rightarrow \frac{1}{4}DD = R$;) wherefore $HH = R + dd$, and therefore $H = \sqrt{R+dd}$: Thus H , if required, is found: Or if H had been given, and d required; now since $HH - R = dd$, therefore $\sqrt{HH - R} = d$.

And having thus found H and D , then $H + d$ ($= O p$) = the greater Root a ; and $H - D$ ($= p n$) = the lesser Root e , which will be Affirmative or Negative according to the Form of the Equation.

CONSTRUCTION of *Quadratics* after another
Method, in Imitation of *Des Cartes*.

In the First Form, which is $ax + d = R$,
Let $FC = a$, the Laffer of the Two Roots, and
 DF or $DT = \frac{1}{2}d$, i. e. Half the Co-efficient.

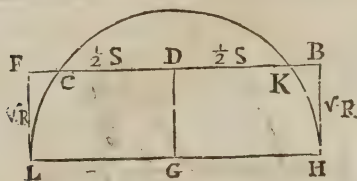


Then will $BC = d + a$, and consequently
 $\square BCF = \square TC$, by 36 e. 3 *Euclid*.
 That is, $aa + da = R$.

In the Second Form, which is $aa - da = R$, Make $BC = a$, the Greater of the two Roots, and DF or $DT = \frac{1}{2}d$ (Half the Co-efficient;) Then will $\square BCF = \square TC$ (by 36e. 3) or $aa - ad = R$.

In the Third Form, which is $Sa - aaR$,
Let $FB = S$, and CB or $FK = a$ (the Greater
Root;) Then will FC or $KB = S - a$.

But by 36.e. 3. Encl. $\square GBK$ or $KFC = \square BH$ or FL ;
That is, $Sa - aa = R$.



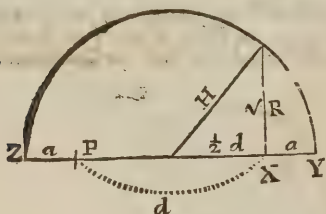
But if KB be supposed equal to a (the lesser Root) Then will $KF = S - a$ and

But $\square KFG \equiv \square FL$, that is, $Sa \vdash a a \equiv R$,
by 36. e. 3. *Euc.*

The Three Forms of *Quadratics* may also be constructed another Way after the following Manner, which agrees very well with *Hartot's* Method of Solution by completing the Square.

Thus ; Suppose $a a + d a = R$:

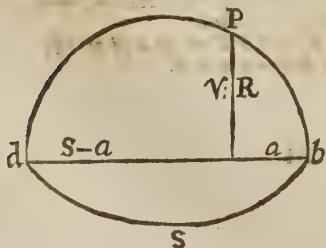
Thus; Suppose $a a + a d = R$:
 Draw a Line, at pleasure, and on it set the Coefficient d , and bisect it: At any End of it erect perpendicularly a Right Line equal to the \sqrt{R} . Then, with the Distance between the Top of the Line and the Middle of d , describe a Circle, which will give you a , as you see; for then \sqrt{R} will be a mean Proportional, and $a a + a d = R R$, by 14. e. 6. *Euclid*.



And here 'tis plain, that if to R , the known or absolute Number, you add the Square of Half the Co-efficient, or of $\frac{1}{2}d$, 'twill give you the Square of H , or of $\frac{1}{2}d + a$; from the Root of which, at last taking $\frac{1}{2}d$, there will remain a , the Lesser of the two Roots sought.

In the Second Form, where $aa - dd = R$. Let xx be supposed $= d$; Then will $xy = a - d$; and consequently (all things being constructed as before) $aa - dd = R$ (by 14. e. 6. *Euch.*) And here, as before, $Qd - dR = HH$, which is equal to $Qd + xr$; to the Square Root of which adding dy you have xx or $py = a$.

As to the Third Form, viz. $Sa - a\bar{a} = R$,



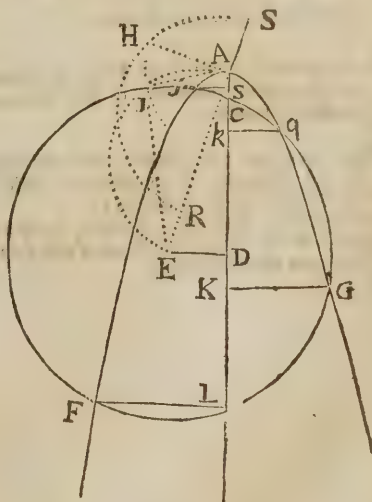
where the Co-efficient is the Sum of the Roots; on S , as a Diameter, draw the Circle apb ; then apply, in a Line equal to the Square Root of R , the absolute Number perpendicularly as before; and then will $S - a \cdot \sqrt{R} : R :: \sqrt{R} : R \cdot a$; (for since $S =$ to the Sum of the Roots, if either be a , the other must be $S - a$) and therefore $Sa - aa = R$.

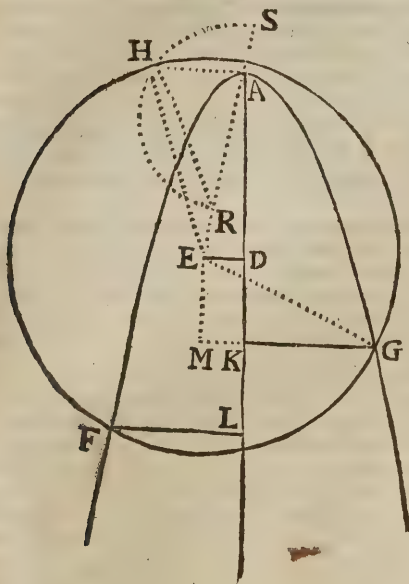
CONSTRUCTION of Cubick and Biquadratic Equations in Algebra.

This, I believe, was first done by *Des Cartes*, who (in the Third Book of his excellent *Geometry*) hath given us a Method for the constructing and finding the true Roots of all Equations, not exceeding four Dimensions, by means of a Parabola and a Circle; which Method was indeed not perfect, because it would not construct any Equations but such as had their Second Term first taken away. However, because it was that which gave the first Rise to *Baker's* excellent Rule, and to whatever Improvements have been since made in it, it's proper to give you an Account of it in the first Place.

When the Second Term is wanting, *Des Cartes* reduces all Cubick Equations to this Form, $Z^3 + apz, aaq = 0$; and Biquadratics to this, $z^{4*} + apz, aaq, aaar = 0$; where a stands for the *Latus Rectum* or *Parameter* of any given *Parabola*, and is supposed equal to 1, that its Power may produce no Trouble in Operation: By which Means the former Equations will stand thus, $Z^3 + pz, q = 0$, and $Z^{4*} + pzz, qz, r = 0$.

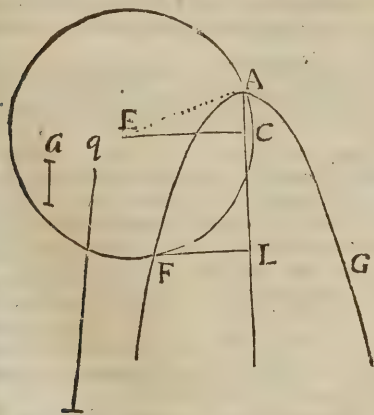
Let then any *Parabola*, as *FAG*, be supposed to be described, whose *Axis* is *ACDKL*, and its *Parameter* $1 = a$, make *AC* equal to $\frac{1}{2}a$, so that the *Point C* will always be within the *Parabola*: Then take in the *Axis* (downwards from *C*, if *P* have a *Negative Sign*, but upwards in the *Axis* produced when it hath a *Positive one*) *CD* $=$ to $\frac{1}{2}p$. Then from the *Point D* (or *C*, if the *Quantity p* be wanting in the Equation) erect a *Perpendicular* to the *Axis*, as *DE*, and make it equal to $\frac{1}{2}q$; which *DE* must be on the *Right-hand*, if it have a *Negative Sign*, but on the *Left* if it be $+q$. After which, describing a *Circle* on the *Center E* with the *Radius EA*, it will (if the Equation be





only a Cubick one) cut the Parabola in as many Points as the Equation hath true Roots; and the Affirmative ones will be Ordinates or Perpendiculars let fall from thence to the Axis on the Right-hand; and the Negative Roots Perpendiculars let fall on the Left-hand of the Axis.

But if the Equation be a Biquadratic one, the fourth Term being there, and having a positive Sign, then from A take $AR = r$, and produce $AS = c$ or 1. Make RS the Diameter of a Circle, and at A erect HA perpendicularly; I say, the other Circle must pass through H , and its Radius



will be EH : But if r have a Negative Sign, there must yet another Circle be drawn on the Diameter AE , in which AI must be applied equal to AH , and that will find the Point I , through which the intersecting Circle must pass, and whose Radius will be IE , and Center E ; which Circle may cut the Parabola in 1, 2, 3 or 4 Points, from

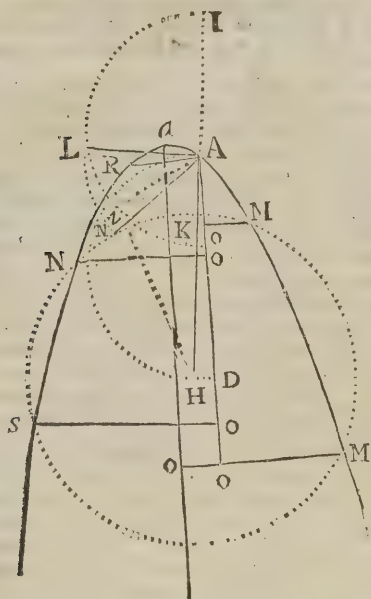
whence perpendicularly let fall to the Axis, will be all the Roots, whether Affirmative or Negative; the former of which will be on the same Side with the Center E when 'tis $+q$, and on the other Side the Axis when 'tis $-q$.

The Demonstration of all which he thus very easily gives us: If the Ordinate GK , by this Construction found, be called Z , then the Abscissa AK will be ZZ , because the Ordinate is a mean Proportional between the Parameter (here 1) and the Abscissa (by the first Property of the Parabola;) wherefore, if from AK you take $AC = \frac{1}{2}$, and also $CD = \frac{1}{2}p$, you will find, by that Means, the Remainder DK or EM , which, in this Notation, will be $ZZ - \frac{1}{2}p + \frac{1}{2}$ (See Figure the First) whose Square will be $Z^4 - ZZp - ZZ + \frac{1}{4}pp + \frac{1}{4}p + \frac{1}{4}$. And because, by the Construction, DE or $KM = \frac{1}{2}q$, the Whole GM will be $= Z + \frac{1}{2}q$, and its Square will be $ZZ + qZ + \frac{1}{4}qq$. Add then this and the former Square of EM together, and you will have the Square of the Radius EG , $Z^4 - ZZp + qZ + \frac{1}{4}pp + \frac{1}{4}qq + \frac{1}{4}p + \frac{1}{4}$ (by 47 *e. Euclid.*) which Radius, or its equal EH , may be expressed another way, if we consider that $ED = \frac{1}{2}q$, and $AD = \frac{1}{2}p + \frac{1}{2}$, for then the Hypothenuse EA will be $\sqrt{\frac{1}{4}qq + \frac{1}{4}pp + \frac{1}{4}p + \frac{1}{4}}$. Wherefore, since AH is a mean Proportional between $AS = 1$, and $AR = r$, it must itself be noted by \sqrt{r} ; Also since EAH is a Right Angle, the Square of EH is the Sum of the Squares of HA and EA , that is, \square of HE or $EG = \frac{1}{4}qq + \frac{1}{4}pp + \frac{1}{4}p + \frac{1}{4} + r$; which last Quantity being equal to $Z^4 - ZZp + qZ + \frac{1}{4}pp + \frac{1}{4}qq + \frac{1}{4}p + \frac{1}{4} = \square EG$, as was proved before: If you compare them together, you will find this Equation to arise $Z^4 = \frac{1}{4} + pZZ - qZ + r$; whence 'tis plain IK is the true Root. Q. E. D.

Thus far went *Des Cartes* in this Matter; but he considering only the Axis of the Parabola, and not thinking of what might be done by the other Diameters, could not construct any Equations, but from which he had first ejected the Second Term. But our *Baker* took the Diameters or Parallels to the Ax also into Consideration, and by that Means did exceedingly perfect and improve this Construction of *Des Cartes*, and made it universal for all Equations not exceeding four Dimensions, without any previous Reduction of them, or taking any of the Terms.

And his Method is this, as you may find in his *Clavis Geometrica*.

Taking any Parabola, let the Parameter or Latus Rectum be called $1 = L$, (that so the Power of L may create no Trouble) and its Vertex a ; then, at Right Angles to the Axis, inscribe $RA = \frac{1}{2}p$, (for half the second Term in the Equation) and then shall its Point A be the Vertex of the Diameter AD , to be drawn parallel to the Axis; so that the Distance of this Diameter from the Axis is always $\frac{1}{2}$ of p , or $\frac{1}{2}$ of pL (for L is $=$ but to 1;) and consequently, when $p = 0$, or when the second Term is wanting (as in *Des Cartes* his Construction) AD will be in the Axis, and the Points R , a and A all co-incident. Next in this Diameter AD , he determines the Point D by the Length of AD , and then erects in D a Perpendicular to DA , as DH , whose Length he determines also, and by that Means finds H the Center of the Circle, which is to intersect or touch the Parabola:



And this he performs by what he calls his *Central Rule*; viz.

$$1. \frac{L}{2} + \frac{p p}{8L} + \frac{q}{2L} = b = AD; \text{ And,}$$

$$2. \frac{p}{4} + \frac{p p p}{6LL} + \frac{p q}{4LL} + \frac{r}{2LL} = d = DH.$$

Which two Rules are demonstrated in his Book and here, under the Word *Central Rule*, which see; and because $L = 1$, they may be contracted thus,

$$1. \frac{1}{2} + \frac{p p}{8} + \frac{q}{2} = B = AD.$$

$$2. \frac{p}{4} + \frac{p p p}{6} + \frac{p q}{4} + \frac{1}{2} r = d = DH.$$

And you must observe, That in the Former of these Rules $+$ signifies downwards from the Point A , and $-$ upwards from it; and in the latter Rule $+$ signifies towards the Left Hand, as $-$ doth towards the Right; So according as the Affirmative or Negative Roots prevail, H will be on the Left or Right Hand of D .

And in both Parts if $p q$ or r be $= 0$, the Member where it is found will vanish and become also $= 0$.

As to the Signs of the Quantities in his Rule, he makes p always retain the Sign it hath in the Equation, but q always puts on a contrary one to what it had there: r is always with a positive Sign, except when $p r$ have contrary Signs in the Equation, and then r will always have a Negative Sign in the Rule.

Having thus, by his *Central Rule*, found H the Center of the Circle, the next Work is to determine the Radius; and if the Equation be no higher than a Cubick, HA is always the Radius; but if it

be a Biquadratick, then supposing $-S$, or that the Fifth Term (or absolute Number) be a Negative Quantity, take in the Line AH produc'd both Ways if there be Occasion $AI = L$ above, and $AK = S$; and making IK a Diameter, describe the Semi-circle KL , and erect at the Point A the Line AL perpendicularly; which therefore will be a mean Proportional between AK and AI : May, the Circle must pass through L , and HL will be the Radius.

But if it be $+S$, you must draw another Diameter HA , and therein fit in or apply $AZ = to LA$ before found (for now the Square of AL is to be taken from HA , as in the former Case it was to be added to it) which will find the Point Z through which the Circle must pass, and the Radius will be HZ , which Circle being drawn, it will cut the Parabola in 4, 3, 2 or 1, or in no Point; and according to the Number of such Intersections, will the real Roots of the Equation be found, which will be always so many Perpendiculars from those Points to AD , as e. gr. NO on the Left Hand, MO on the Right, &c. Of which, if there be no p or Second Term, and also it be $-r$, then on the Left Hand are the Positive Roots, and the Negative ones on the Right Hand: But if the Second Term be there, and with a Negative Sign, as $-p$, then NO on the Left Hand are Affirmative, and the others MO on the Right Negative; but if it be $+p$, 'tis on the contrary; NO Negative, and MO Positive.

The Demonstration of all which is very easy to one that hath considered the Demonstration above given from *Des Cartes*, on which this entirely depends; taking into Consideration also the Property of the Parabola, which *Baker* had from Mr. *Seade* of *Maperton*, that *The Latus Rectum*: Is to the Sum of any two Ordinates :: As their Difference, Is to the Difference of the Abscisse.

CONSTRUCTION, in Geometry, is the drawing of such Lines as are previously necessary for the making any Demonstration appear the more plain and undeniable; and this Construction is always of such things as are well known and sought before.

CONSTRUCTION, in Grammar, is the natural, just and regular placing and disposing of Words in a Discourse, so as to make proper and intelligible Sense.

CONSULTATION, is a Writ whereby a Cause being formerly removed by Prohibition from the Ecclesiastical Court, or Court Christian, to the King's Court, is returned thither again; for the Judges of the King's Court, if, upon comparing the Libel with the Suggestion of the Party, they do find the Suggestion false, or not proved, and therefore the Cause to be wrongfully called from the Court Christian, then, upon this Consultation or Deliberation, they decree it to be returned again; whereupon the Writ in this Case obtained is called a Consultation.

CONSUMPTION, in general, signifies a Defect of Nourishment, or the consuming, wasting or decaying of the Body; and particularly of the Muscular Flesh: 'Tis frequently attended with a *Hætic* Fever, and is divided into several Kinds according to the Variety of its Cause, and the Parts it principally affects, as a *Scorbutick Consumption*, a *Consumption of the Lungs*, &c.

CONTACT, is when one Line, Plane or Body is made to touch another, and the Parts that do thus touch are called the Points or Places of *Contact*.

CONTAGION, the communicating or transferring of a Disease from one Body to another, by certain Steams or Effluvia transmitted from the Body of the Sick Person. Some Diseases are *Contagious* by immediate contact or touch, as the Madness of a Dog, which is communicated by Biting; and the Venom of the *French-Pox*, which is transmitted from the infected Person in the Act of Copulation; sometimes the *Contagion* is propagated by infected Cloaths, as in the Itch and Leprosy: And there are some *Contagions* that are transmitted through the Air to a considerable Distance, as the Plague and other Pestilential Distempers; in which Case the Air is said to be *Contagious*; that is, full of *Contagious* Particles or *Effluvia*.

CONTEMPLATION, is the preserving of the *Idea* which is brought into the Mind for some time actually in view.

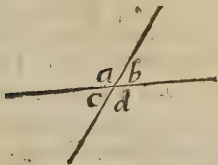
CONTENEMENT, seems to be Free-hold-Land which lies next a Man's Tenement or Dwelling-House, that is, in his own Occupation.

CONTENT, in *Solid Geometry*, is the Measure of any Solid Figure, viz. in Cubick Inches or Feet, &c.

CONTIGUITY, is only the Surface of one Body's touching that of another. But *Continuity* is the immediate Union of the Parts which compose any Natural Body, so that one cannot tell where one begins, and another ends.

CONTIGUOUS

Angles, in *Geometry*, are such as have one Leg common to each Angle, and are otherwise called *Adjoining Angles*. Thus, the Angles *a* and *d* are called *Contiguous Angles*, but *b* and *c* *Opposite or Vertical*: See *Angle*.



CONTINENT, in *Geography*, is a great Extent of Land, which comprehends several Regions and Kingdoms, and which is not interrupted or separated by Seas.

CONTINENT Cause of a Distemper, is that on which the Disease depends so immediately, that it continues so long as that remains, and no longer. Thus a Stone sticking in the *Ureters*, is the *Continent Cause* of a Suppression of Urine.

CONTINENT Fever, is that which performs its Course without either Intermision or Remission.

CONTINGENT, is a Casual Event, which may or may not happen to come to pass: 'Tis sometimes also in *Mathematicks* used for the Word *Tangent*.

CONTINGENT Line, in *Dialling*, is supposed to arise from the Intersection of the Plane of the Dial with the Plane of the Equinoctial; and consequently in this Line the Hour Lines of the Dial and the Hour Circles intersect each other. This Line is always at Right Angles with the Subtilar Line.

CONTINGENT Line, the same with *Tangent Line*.

CONTINUAL Claim, is a *Claim* made from Time to Time within every Year and Day, to Land or other Thing, which, in some respect, we cannot attain without Danger.

CONTINUAL Fever, is that which sometimes remits or abates, but never perfectly intermits; that is, the sick Person is sometimes better, but never perfectly free from the *Fever*.

CONTINUAL Proportion, *Arithmetical* and *Geometrical*: See *Progression*.

CONTINUANDO, is a Word used in Law, when the Plaintiff would recover Damages for several Trespasses in the same Action: For in one Action of Trespass they may recover Damages for divers Trespasses, laying the first with a *Continuando* to the whole Time, and in this Form;

CONTINUANDO Transgressionem predictam, &c. à predicto die, &c. usque talem diem; to including the last Trespass.

CONTINUED Quantity or a *Continuum*, is that whose Parts are inseparably joined and united together, so that you cannot distinguish where one begins and another ends: See *Discrete Quantity*.

CONTINUED Zocle: See *Zocle*.

CONTRABANDED Goods, are such as are prohibited by Act of Parliament or Proclamation to be imported into, or exported out of this into other Nations.

CONTRACT, is a Covenant or Agreement, with a valuable or lawful Cause or Consideration; or else one thing must be given for another, which is called *Quid pro quo*; as if I sell my Horse for Money, or Covenant to make you a Lease of my Mannor in Consideration of so much Money; these are *Good Contracts*, because one thing is given for another: But if a Man make Promise to me that I shall have Twenty Shillings, and that he will be Debtor to me thereof; and after I ask the Twenty Shillings, and he will not deliver it; yet I shall never have an Action to recover, because the Promise was no *Contract*, but a bare Promise, and *ex nudo Pacto non oritur Actio*: But if any thing were given for the Twenty Shillings, though it be but the Value of a Penny, then had it been a *Good Contract*.

CONTRACTILE, is a Word used by some Physicians to express such Muscles, and other Parts of the Body, as are usually contracted.

CONTRADICTORY Propositions, in *Logick*, are either such as consist of an Universal and Particular, of which one Affirms, and the other Denies, as thus; *All Right lined Triangles have the Sum of their Angles equal to two Right ones; some Right lined Triangles have not the Sum of their Angles equal to two Right ones*; or else they are both Singular and Particular, one Affirming, the other Denying the same Thing, as the *Circle is Squarable, the Circle is not Squarable*.

CONTRA-Fissura, or *Counter-Fissure*, is a Fissure on one Side of the Head, occasioned by a Blow or Fall upon the other.

CONTRA Formam Collationis, is a Writ that lies where a Man hath given Lands in perpetual Alms to any Religious House, Hospital, &c. For if they Alien the Lands, then the Donor or his Heirs may recover them by this Writ, but not of the Alien, although he be Tenant; tho' in all other Actions, where a Man demands Free-hold, the Writ shall be brought against the Tenant.

CONTRA Formam Feoffamenti, is a Writ that lies for the Heir of a Tenant infeofed of certain Lands

Lands or Tenements by Charter of *Feesment* of a Lord, to make certain Services and Suits to his Court, and is afterwards disfreind for more than is contained in the said Charter: This Writ lies not for the Plaintiff, who claims to purchase from the first *Feeoffee*, but for the Heir to the first *Feeoffee*.

CONTRA-Indications, are divers Considerations in a Disease that dissuade a Physician from using such a Remedy, when other Things induce him to it.

CONTRAMANDATIO Placiti, in Law, seems to signify a Respite, or giving the Defendant further Time to answer; or an Imparance, or Countermanning what was formerly ordered.

CONTRA Mure, in Fortification, is a little Wall built before another Partition Wall to strengthen it, so that it may receive no Damage from the adjacent Buildings.

CONTRARY Propositions, in Logick, are two universal Enunciations, of which one Affirms, and the other Denies; as *all Squares are Parallelograms*; *no Squares are Parallelograms*.

CONTRATE Wheel, is that Wheel in Pocket-Watches and others which is next to the Crown-Wheel, whose Teeth and Hoop lie contrary to those of other Wheels, whence it hath its Name.

CONTRAVALLATION, or *The Line of Contravallation*, in Fortification, is a Trench guarded with a Parapet, and usually cut round about a Place by the Besiegers, to secure themselves on that Side, and to stop the Sallies of the Garrison; 'tis without Musket-Shot of the Town; so that the Army forming a Siege, lies between the Lines of *Circumvallation* and *Contravallation*.

CONTRE-Queue d'ironde, a Term in Fortification, the same with the *Counter-Swallow's Tail*, which see.

CONTRIBUTIOE Facienda, is a Writ that lieth where more are bound to one Thing, and but one is put to the Burden: As if Joint-Tenants, or Tenants in Common hold a Mill, *pro indiviso*, and are equally to take the Profits thereof; the Mill falling to Decay, and one or more of them refusing to contribute towards the Reparation, the rest shall have this Writ to compel them.

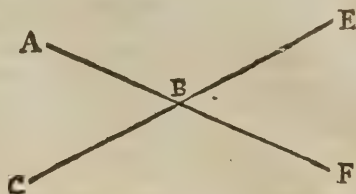
CONTROLLER, is an Officer who keeps a Roll of all other Officers Accounts; and in *England* we have divers Officers of this Name, as *Controller of the King's House*, *Controller of the Navy*, *Controller of the Customs*, *Controller of Callis*, *Controller of the Mint*, *Controller of the Hamper*, who takes all Things sealed in Leather Bags from the *Clerk of the Hamper*; and *Controller of the Pipe*, who writes Summons to the Sheriffs to levy the Debts of the Pipe.

CONTUSION of a Bone, is the bruising of a Bone by some hard and blunt Thing, that though it outwardly appear Whole, yet inwardly it is really Injured and out of Order.

CONVENTIO, is a Word used frequently both in Ancient and Modern Pleadings at Law.

CONVENTION, is a Writ that lieth for any Covenant in Writing not performed. *Fitz-Herbert* calls it a *Writ of Covenant*: *Nat. Brev. Fol. 145.*

CONVERGING, or *Convergent Rays*, in *Opticks*, are those Rays which going from divers Points of the Object, incline towards one another, till at last they meet and cross, and then become



Diverging Rays. Thus the Rays *AB* and *CB* do Converge till they come to the Point *B*, and then they Diverge and run off from each other in the Lines *BE*, *BF*.

CONVERSE: In Mathematics one Proposition is called the *Converse* of another, when after a Conclusion is drawn from something supposed in the *Converse* Proposition, that Conclusion is supposed; and then that which in the other was supposed, is now drawn as a Conclusion from it. Thus; as when two Right Lines are supposed to be parallel; and another crosses them, 'tis demonstrable that the Alternate Angles are equal; so 'tis equally true Conversely, that if the Alternate Angles are equal, the Lines which are crossed must be parallel.

CONVERSION of Equations, in *Algebra*, is thus; if the Quantity sought, or any Part or Degree of it be in Fractions, let all be reduced to one common Denomination (by Multiplication of the Whole, by the Denomination of the Fractional Part) and then omitting the Denominators, continue the Equation in the Numerators only. Thus, suppose $a - b = \frac{aa + cc}{d} + b + b$; multiply all

by *d*, and it will stand thus, $da - db = aa + cc + db + db$. 'Tis called by *Vieta*, *Isomeria*.

CONVERSION of Propositions, in Logick, is the changing of the Subject into the Place of the Predicate, and the Predicate into the Place of the Subject, and yet always retaining the same Quantity of both Propositions; as, Every Right-lined Triangle hath the Sum of its Angles equal to two Right ones; every Right-lined Figure that hath the Sum of its Angles equal to two Right ones, is a Triangle.

CONVEXITY, signifies any Protuberancy or swelling out of any thing; as Glasses are said to be *Convex*, when they are thicker in the Middle than at the Edges; or rather, when their Surface rises up regularly (so *Vitellio* defines it) above the Plane of the Base; as they are *Concave*, when the Surface sinks down regularly, or with a regular Curvity below it; so that the same Thing may be, and often is, *Concave* within, and *Convex* without.

Here follow some Properties of *Convex Glasses*.

1. If an Object be in the Focus of a *Convex* Glass, and the Eye on the other Side the Glass, the Object will appear erect and distinct.

2. If any Object be in the Focus of a *Convex* Glass, and the Eye in the opposite Focus on the other Side, it will appear under the same Angle, as if

if the Eye were in the Place of the Glass; and consequently the Distance being double in that Position of the Eye and Object, it will appear thro' the Glass magnified under an Angle almost double of what it would appear to the naked Eye; but the Eye can see no more of its Area than the Breadth of the Glass will permit.

Mr. *Molyneux*, in his *Diotrica Nova*, shews how to determine the visible Area of an Object in the Focus of a *Convex Glass* from the Distance of the Object, and of the Eye from the Glass, and the Glass's Breadth. P. 126. Prop. 34.

3. If an Object be farther from a *Convex Glass* than the Focus, and the Eye on the other Side be nearer than the distinct Base of the Glass, it will see the Object erect but confus'd; and it will be most confus'd when the Eye is placed in the distinct Base.

4. But if the Object being placed as before, the Eye be farther from the Glass than a distinct Base, it begins to see the Object *Inverted*, and at a due Distance distinct.

5. If the Object be nearer than the Focus, it will appear erect and distinct to an Eye placed on the other Side the Glass, at any Distance within the Eye's Power to discern it.

CONVICT, in the Common Law, is he that is found guilty of an Offence by the Verdict of a Jury: But *Crompton* says, that *Conviction* is either when a Man is Out-lawed, or appeareth and confesseth, or else is found Guilty by the Inquest.

CONVOCAION, is commonly taken for the General Assembly of the Clergy, to consult of Ecclesiastical Matters in Parliament; and as there are two Houses of Parliament, so there are two Places called *Convocation Houses*; the one called *The Higher*, where the Archbishop and Bishops sit severally by themselves; the other, *The Lower Convocation House*, where all the rest of the Clergy sit. An English *Convocation* or *Synod*, as it now stands for the Province of *Canterbury*, consists of a *President* (the Lord Archbishop) and 24 Bishops, 22 Deans, 53 Archdeacons, 24 Proctors of Chapters, 44 Proctors for the Diocesan Clergy, (2 for each Diocese) and one *Præcentor*. *Cowell's Interpreter*.

CONVOLUTION, is a winding or turning Motion, which is proper to the Trunks of some Plants; as the *Convolvulus* or *Bindweeds*, and to the Claspers of Vines and of *Briony*; and Dr. *Grew* thinks that all those Plants whose Roots are twisted, have such a *Convolution*; and he assigns two great Efficient Causes of this winding Motion, the *Sun* and the *Moon*: Methinks 'twere worth the while, as 'tis very easy, to try whether there be any such *Convolution* or not in the Trunks of Plants, which may easily be done, as he hints, by tying a little Bit of Paper to any of the Branches which are exactly *South*, *North*, &c. and then seeing whether it will change its Position or not, in respect of the Point of the Compass.

CONVOLVULUS: See *Iliac Passon*.

CONUS Fuserius, is a sort of Crucible made

to melt Iron or any other Metal. *Blanchard*.

CONUSANCE, the same with *Cognisance*.

CONUSANT, in the Common Law, signifies Knowing or Understanding; as if the Son be *Conusant*, and agrees to the Feoffment. *Cook* upon *Littleton*. Fol. 159. b.

CONVULSION, is a Motion whereby the Nerves, Muscles and Members are contracted or remitted against the Will, or without it, as in the *Cramp*, *Epilepsy*, &c. *Blanchard*.

CONVULSIVE Motions, are sudden and swift Concussions or Shakings that cease and return alternately.

COOK-Room, in a Ship, is variously seated in some, and generally in great Ships it is in the Fore-Castle; in some other Ships it is seated in the *Hatch-way*, upon the first *Orlope*; and for Ships of War (which are termed Men of War) it might most properly be there, in regard of Danger by Fire; and the freer Use of the Guns that lie in the Fore-Castle, especially if this *Cook-Room* (as some conceive) may be contrived to be moveable, and so in a Fight be struck down into the Hold of the Ship. But after all, I cannot apprehend how it can be otherwise placed than in the Fore-Castle in great Ships, by reason of the Multitude of Men, which require, necessarily, the dressing of much Meat, and as necessarily a large and private Room to dress it in.

COPERCENERS, or *Parceners*, in Common Law, are such as have equal Portions in the Inheritance of their Ancestors; and as *Littleton* in the Beginning of his Third Book, saith, *Parceners* be either by Law or by Custom; *Parceners by Law* are the Issue Female which (no Heir-Male being) come in Equality to the Lands of their Ancestors. *Parceners by Custom*, are those that by Custom of the Country challenge equal Part in such Lands; as in *Kenil*, by the Custom called *Gavel-kind*. This, amongst the *Feudists*, is called *Adequatio*.

COPERNICAN System, the same with the most Ancient or Pythagorean System of the World, which *Copernicus* revived; and it is since improved, and now generally adhered to by Astronomers, and is as follows.

1. The Sun is supposed to be placed in the Middle, very near the Center of Gravity of the entire System, in the common Focus of every one of the Planetary Orbits.

Next to him *Mercury*, in about three Months Time, describes his *Ellipsis*, and that so near, that we on the Earth rarely obtain a distinct View of him.

Next to *Mercury* is the *Elliptick Orbit* of *Venus*, whose Period is 7 Months $\frac{1}{2}$; and next to *Venus*, our Earth with its Attendant the *Moon* perform a joint Course, and measure out the Annual Period.

Next to the *Earth*, *Mars* alone, without any visible Guard or Satellite accompanying him, revolves about the same Center in about two Years Time.

Next to *Mars*, tho' at a mighty Distance from him, the largest of the Planets, *Jupiter*, with his four remarkable Satellites, takes his Round in 12 Years.



And Lastly, *Saturn* with his five little *Moons* about him, according to *Cassini*, describes in 30 Years time, the farthest and most remote Orbit; and compleats the intire Planetary *Chorus*, as the Figure represents.

Besides the Planets, whose Orbits are not very different from Circles, there are another *Species* of Bodies which are called *Comets*, revolving about the *Sun* in such *Ellipsis*, as may pass almost for *Parabola's*, they are so exceeding Eccentricall; but as regularly retaining their several Periods and Orbits as the Planets themselves, of which see *Comets*.

COPHOSIS, is a Deafness in the Ears. *Blanchard*.

COPIA Libelli deliberando, is a Writ that lieth, in Case when a Man cannot get the *Copy* of a Libel at the Hands of a Judge Ecclesiastical.

COPOS, is a Weariness of the Body, when the *Muscles*, or their *Fibres* rather, are loaden and obstructed with such viscous Humours, that they are rendred unfit for Motion. *Blanchard*.

COPPEL, or *Coppie*: See *Cuppel*.

COPROCRITICA, are Medicines which purge away the Excrement in the Guts. *Blanchard*.

COPULA, in *Logick*, is the Verb that connects any two Terms in an Affirmative or Negative Proposition; as God is Good, where (*is*) is the *Copula*. Riches alone make not a Man Happy, where (*make*) is the *Copula*.

COPULATIVE Propositions, are those that include several Subjects or several Attributes joyn'd together by an Affirmative or Negative Conjunction;

on; that is to say, *and* (not) or (*neither*;) For (*neither*) does the same thing as (*and*) in these sorts of Propositions, for that (*neither*) signifies (*and*) with a Negative, which falls upon the Verb, and not upon the Union of the two Words which it joins; as if I should say, *That Knowledge and Riches don't make a Man happy*: Here I unite Knowledge and Riches, affirming of both that they don't make a Man happy.

COPY-hold, is a Tenure for which the Tenant hath nothing to shew but the Copy of the Rolls made by the Steward of the Lord's Court; for the Steward as he doth inroll and make Remembrances of all other things done in the Lords Court; so he doth also of such Tenants as he admitteth into the Court, to any parcel of Land or Tenement belonging to the Mannor; and the Transcript of this is called *The Copy of the Court Roll*, which is all the Tenant taketh from him, and keeps as his own Evidence: This Tenure is call'd *A Base Tenure*, because it holdeth at the Will of the Lord: It is wont to be called *Tenure in Villanage* by some, who also say, that *Copy-hold* is but a new Name, yet it is not simply at the Will of the Lord, but according to the Custom of the Mannor: So that if a *Copy-holder* break not the Custom of the Mannor, and thereby forfeit his Tenure, he seemeth not so much to stand at the Lord's Curtesie for his Right, that he may be displaced hand over head at his pleasure. These Customs of Mannors be infinite, varying in one Point or other almost in every several Mannor.

First, Some *Copy-holds* are *fineable* at Will, and some *certain*: That which is *fineable* at Will, the Lord

Lord taketh at his Pleasure, but if it exceed two Years Revenue, the *Chancery*, *King's-Bench*, *Common-Pleas*, or *Exchequer*, may reduce them to Reason. That which is *certain*, is a kind of Inheritance, and called in many places *customary*, because the Tenant dying, and the *Hold* being void, the next of Blood, paying the customary Fine (as 2s. for an Acre, or such like) may not be denied his Admission.

Secondly, Some Copy-holders have, by Custom, the Wood growing upon their own Land, which by Law they could not have.

Thirdly, Copy-holders, some be such as hold by the *Verge* in ancient *Demesne*; and although they hold by Copy, yet are in Account a kind of *Free-holders*, for if such a one commit Felony, the King hath *Annum, Diem et Vestium*, as in the Case of *Free-hold*. Some other hold by *Common Tenure*, called *Meer Copy-hold*, and they committing Felony, their Land escheateth to the Lord of the Mannor.

COR, the Heart, is a fleshy *fibrous* Substance made up of several *Muscles* and *Tendons*; it has two *Auricles* or *Ears*, and as many *Ventricles*: the *Vena Cava*, or great Vein, is fasten'd to the Right *Auricle*, and the *Pulmonary Vein* to the Left; the *Pulmonary Artery* is join'd to the Right *Ventricle*, and the great *Artery* to the Left. It is clothed with a little *Membranous Bag*, called the *Pericardium*, wherewith it is joyned to the *Mediastinum*, and the *Diaphragm*; its Basis is upwards, and Point downwards, and it is placed in the Middle of the Chest amongst the Lobes of the Lungs. Its Use is to receive and disperse the Blood to all Parts in the Body. The Base of the Heart is environed round with a *Plexus* of Veins and Arteries.

Our Excellent Dr. *Lower* was the first that gave us the true Mechanical Structure of the Heart, and a very good rational Account of its Action: He explains the *Systole* of the Heart, by the natural Method of muscular Contraction; but in order to account for its *Diastole*, he hath recourse to a certain unaccountable Motion of *Restitution*, which seems not to be so well grounded.

The Heart being a single Muscle without an Antagonist, appears to be of the *Sphindler* kind; and *Borellus* in his *Oeconomia Animalis*, computes the Motive Power of a Man's Heart to be more than that of a Weight of 3000 lb. The Obstacles to the Motion of the Blood through the Arteries, he judges equivalent to 18000 lb. i. e. 6 times as much as the Power of the Heart: He estimates the Power of the *Elastick Coat* of the Arteries at 45000 lb. whose Adventitious Help to move the Blood being deducted, he leaves the Heart with a force, but of 3000 lb. to surmount a Resistance of 155000 lb. that is, with one to move 45; and this mighty Power in the Heart he ascribes to the Force of Percussion. Dr. *Drake*, in his Discourse of the Motion of the Heart in *Phil. Transact.* N. 280, supposes that Respiration hath a great Influence to assist it; and that even the *Systole* or *Constriction* of the Heart is occasioned in some measure by the help of the *Diaphragm* and *Intercostal Muscles*, by whose Means the Blood hath a Passage opened for it into the Lungs, which denied, would be an Invincible Obstacle: And he thinks also that the *Systole* is furthered by the Situation and Capacity of the Blood-Vessels of the Lungs, in the several Times of the Elevation and Depression of the Ribs; for by this Means a Passage is opened to the Blood to flow from the Right Ventricle of the Heart to

the Left thro' the Lungs, to which it could not otherwise pass; and the Opposition which the Blood contained in that Ventricle, must otherwise have made to its *Constriction*, is taken off. And thus the Dr. with great probability, supposes the *Systole* of the Heart to be much facilitated by the Action of the *Thorax*: But he saith, that neither the *Diaphragm* nor *Intercostal Muscles* can contribute any thing towards the *Diastole*, the Cause of which, be it what it will, must be equal to that of the Heart, the *Intercostal Muscles*, and the *Diaphragm*, to all which it acts as an *Antagonist*, dilating the Heart, as they constrict or close it. The Dr. thinks such a Power or Cause is not to be found any where in an Animal Body, and therefore it must be sought without it; and he concludes that this Cause is the Weight of the incumbent Atmosphere pressing upon the *Thorax* and other parts of the Body, which he proves from Mr. *Boyle's* Experiments upon Animals in *Vacuo*, where, as soon as the Pressure of the Incumbent Atmosphere is removed, the *Intercostal Muscles* and *Diaphragm* are contracted, and the Ribs elevated in an Instant, and can't by any Power of the Will be made to subside, till the Air is let in again to bear them forcibly down: And, as in the Elevation of the *Galle*, the Blood is in a manner solicited by the Passage now opened for it to flow into the Lungs; so in the Depression of them by the Subsidence of the Lungs, and the Contraction of the Blood Vessels (both which are consequent thereupon) the Blood is forcibly driven, as it were by an Embolus, through the *Pulmonary Vein* into the Left Ventricle of the Heart; and that, together with the general Compression of the whole Body, by the Weight of the Atmosphere, which surrounds, and gravitates upon the whole Surface of it, is that Power which causes the Blood to mount in the Veins, after the force impress'd upon it by the Heart is broken and spent, and which is sufficient to force the Heart from its Natural State to Dilatation. And thus by the Contraction of the Heart (the proper Action of all Muscles) and its Dilatation again this way, is the Circulation of the Blood set forward and kept going on.

COR, is by the *Botanists* used to signify the inward soft pithy and spongy part of any Tree or Plant, which they call also *Medulla* and *Materia Arboris*.

COR Caroli, an extraneostellated Star in the Northern Hemisphere, situated between the *Coma Barentis*, and *Ursa major*, so called in Honour of King Charles.

COR Hydra, a fix'd Star of the first Magnitude in the Constellation of *Hydra*; its Longitude is 142 deg. 49 min. Latitude 20 deg. 23 min.

COR Leonis: See *Regulus* or *Basilius*.

CORACORRACHIALIS, or *Coracobrachialis*, is a Muscle so called from its Origination and Insertion: It arises partly fleshy, and partly tendinous, from the Extremity of the *Processus Coracoides Scapulae*, and in its Descent it becomes larger, strictly adhering to the Internal Tendon its beginning of the *Biceps*; and parts from it near its Tendinous Insertion at the Middle of the Internal Part of the *Os Humeri*: Thro' this Muscle passes a large Nerve, wherefore by some it is called *Perforatus*. When at rest, the Arm is moved upwards, and turned somewhat obliquely outwards.

CORACOHYOIDES, are Muscles which proceed from the Process of the Shoulder-bone, call'd

Coracoides, and go on as far as the Bone *Hyoides*; their Use is to move obliquely downward.

CORACOIDES, is the Process of the Shoulder-blade, in form of a Beak.

CORAM non Judice, is a Term in the Common Law, when a Cause is brought into a Court wherein the Judges have no Jurisdiction.

CORBEILS, in Fortification, are little Baskets about a Foot and a half high, eight Inches broad at the bottom, twelve at the Top; which being filled with Earth, are frequently set one against another upon the Parapet, or elsewhere, leaving certain Port-holes, from whence to fire upon the Enemy under Cover, without being seen by them.

CORD, in Geometry: See *Chord*.

CORDAGE at Sea, signifies in general all the Ropes belonging to the Rigging of a Ship.

CORDIALIA, are Medicines which are commonly thought to strengthen the Heart; but they only put the Blood into a fine gentle Fermentation, which corroborates and facilitates the Motion of the Heart. *Blanchard*.

CORDON, in Fortification, is a Row of Stones made round on the outside, and set between the Wall and the Fortrefs which lies in *Talu*, or a Slope, and the Parapet which stands perpendicular after such a manner, that this Difference may not be offensive to the Sight; so that those *Cordons* serve only as Ornaments ranging round about the Place; neither are they used but in Fortifications made of Mason's Work, the void Space being filled up with pointed Stakes in those that are raised with Earth.

CORDS, in Musick, properly signifies the Strings of a Harp, Violin, Lute, or any other Musical Instrument: But the Term is also applied to denote the Sounds which proceed from such Instruments, even from those that have no Strings.

CORINTHIAN Order of Architecture, is so called from *Corinth*, the Place of its Invention. It observes the same Measure with the *Ionick*, and the Difference between them is chiefly in the *Capital*. See *Order and Column*.

Vitruvius makes the Height of the *Capital* to be two Modules, and this he divides into seven parts, of which the first is for the *Abacus*, and the other six downwards are for the Ornament.

CORNACHINE Powder, the same with what is sometimes called the *Earl of Warwick's Powder*, and by Foreign Writers frequently *Pulvis de tribus*; it is a purging Powder made of equal parts of *Antimonium Diaphoreticum*, *Diagridum*, and *Cream of Tartar*.

CORNEA Luna: See *Luna Cornea*.

CORNEA Oculi Tunica, which is also called *Sclerotes*, and *Dura*, the hard Tunick, proceeds from a Tunick in the Brain called *Dura Meninx*; it is pellucid forwards, that it may transmit the visible Species: Its Sides are covered with the *Albugineous Tunick*; inwardly it contains the *Aqueous Humour*.

CORNICHE, or as we pronounce it, *Cornish*, in Architecture, is the third and highest part of the *Entablature*, and is commonly used to signify the uppermost Ornament of any Wainscot, &c. In reference to the *Pillar*, 'tis different according to the different Orders of Architecture. In the *Tuscan* 'tis without Ornaments, and this *Pillar* of all others hath the least Mouldings. The *Doric*

is adorn'd with *Dentils* like the *Ionick*, and which sometimes hath its Mouldings cut into it. The *Corinthian* *Pillar* hath of all others the most Mouldings, and those very often cut with *Modillions*, and sometimes *Dentils*. The *Composite* hath its *Dentils* and its Mouldings cut, with its Channels or Chamferings under its *Plafond*.

CORNICULARIS Processus: See *Ancyroides*.

CORNICULATE Plants and Herbs, are such as after each Flower produce many distinct and horned Seed-pods; which Seed-vessels are called *Silique*: This kind is called also *Multisiliquous*; such as the *Sedum* or *Sempervivum*, *Telephium*, *Sedum Stellatum*, *Juncus Floridus*, *Helleborus Niger*, *Fra-xinella*, *Aconitum* (or *Napellus*) *Aquilegia*, *Delphinium*, *Peonia*, *Caltha Palustris*, *Althea Lutea*, &c.

CORNISH Ring of a Gun, is the next from the Muzzle Ring backwards: See *Ordinance*.

CORNUA Uteri, are two lateral parts of the Womb in some Brutes, as Cows, Harts, Sheep, Goats, &c. yet some Authors have attributed the same parts to a Woman's Womb from something which imitates them there; for at the Sides of the Bottom of the Womb, there is a sort of *Protuberance* on both Sides, where the *Vasa Deferentia* are inserted; yet a Woman's Womb is rarely *Bipartite*, as it is in Brutes.

CORODIO Habendo, is a Writ whereby to exact a *Corody* of an Abby, or Religious House.

CORODY Habendo, in Common-Law, signifies a Sum of Money, or Allowance of Meat, Drink, and Cloathing, due to the King from an Abby, or other House of Religion, whereof he is Founder, towards the reasonable Sustainance of such a one of his Servants, being put to his *Pension*, as he thinketh good to bestow it on. And the Difference between a *Corody* and a *Pension* seems to be, That a *Corody* is allowed towards the Maintenance of any of the King's Servants that liveth in an Abby: a *Pension* is given to one of the King's Chaplains, for his better Maintenance in the King's Service, until he may be better provided of a Benefice. It appears in *West. 2. Cap. 25*. That an Assize shall lie for a *Corody*; and in others, That *Corodies* belonged sometimes to Bishops from Monasteries; and also, That a *Corody* may be due to a common Person, by Grant from one to another; or of common Right, to him that is a Founder of a Religious House, not holden in *Franc-Almoine*, for that Tenure was discharged of all *Corodies* in it self. And a *Corody* is said to be either certain or uncertain, and that it may be for Life, for Years in Tail, or in Fee.

COROLLARY or Consequary, is an useful Consequence drawn from something which hath been already advanced or demonstrated; as if from this, viz. That a Triangle which has two equal sides, has also two Angles equal; you should draw this Consequence, That a Triangle which has the three Sides equal, has also its three Angles equal.

CORONA, in Architecture, is properly the flat and most advanced part of the Cornice, called by the French *Larmier*, and by us the *Drip*, because it defends the rest of the Work from Wind and Weather; but it is often taken by *Vitruvius* for the whole Cornice.

Corona, or the Flat-Crown, is also a particular Member in the *Doric* Gate, made by so extraordinary an Enlargement of the *Larmier* or *Drip*, that it hath six times more breadth than Projection. This sort of *Corona* is nowhere found amongst

mongst the Ancients, except only in the Writings of *Viruvius*.

CORONA Borealis, or the Northern Garland, a Constellation in the Northern Hemisphere, consisting of about 20 Stars.

CORONA Meridionalis, a Southern Constellation consisting of 13 Stars.

CORONALE: See *Frontis*.

CORONALIS Sutura, is a Cleft in the Head made like a Comb, and joins as if the Teeth of two Saws were closely compacted into one another: It is placed in the upper Part of the Skull from one Temple to another, and is circumscrib'd with the Bones of the Forehead, and that particularly called *Bregma*; in the Middle whereof the *Suture*, styled *Sagittalis*, is terminated.

CORONARIA Vasa, are the Veins and Arteries which surround the Heart to nourish it: They arise out of the *Aorta* before it comes out of the *Pericardium*; they encompass the *Basis* of the Heart like a Garland; in their Circuit send down divers Twigs length-ways of the Heart, and when they have encompassed the *Basis* and meet, they inosculate with one another, but not with the *Veins*.

CORONATORE Eligendo, is a Writ which, after the Death or Discharge of any *Coroner*, is directed to the Sheriff out of the *Chancery*, to call together the Free-holders of the County for the Choice of another *Coroner*; and to certify into the *Chancery* both the Election and Name of the Party elected, and to give him his Oath.

CORONE, is an Acute Process of the lower Jaw-bone, from its Likeness to the Beak of a Raven called *Rostriformis*, in the Form of a Beak.

CORONER, is an ancient Officer of this Land, so called, because he dealeth wholly for the King and Crown: There be four of them commonly in every County, and they are chosen by the Free-holders of the same upon Writ, and not by Patent. His Office especially concerneth Pleas of the Crown. There be also certain special *Coroners* within divers Liberties, as well as those ordinary Officers in every County; as the *Coroner of the Verge*, which is a certain Compass about the King's Court: And there are certain Charters belonging to Colleges and other Corporations, whereby they are licensed to appoint their *Coroner* within their own Precincts.

CORPORA Cavernosa Penis (by *D'Graaf* called *Nervosa*, and by others *Nervæ Spongiosa*) are two *Capsula* or oblong *Folliculi*, fenced every where without with a thick Membrane: They spring with two distinct Originals from the lower Side of the *Ossa Pubis*, whence stretching forwards, they meet one another, leaving an Intertice before their Conjunction, in which the *Urethra* is conveyed: Where they leave the *Ossa Pubis* they are each covered with a Membrane, and afterwards joined to each other by the Intervention of a *Septum Intermedium*, which, the nearer it comes to the Glans, is the more diminished.

CORPORA Olivaria: See *Olivaria Corpora*.

CORPORA Pyramidalia, are Protuberances of the under Part of the Brain; they are in Length of about an Inch.

CORPORA Striata, are Protuberances upon the *Crura Medullæ Oblongatæ*.

CORPORAL, is an inferior Officer in a Foot Company, who hath charge over one of the Divisions; places and relieves Centinels, and keeps good Order in the *Corps de Garde*: He receives the Word

of the Inferior Rounds that pass by his *Corps de Garde*.

CORPORATION, is a Body Politick authorised by the King's Charter, being of Capacity to take and grant, having a Common Seal, &c. These are constituted either by Prescription, by Letters Patent, or by Act of Parliament, and are either *Spiritual* or *Temporal*.

CORPOREITY, the School Term for the Nature of a Body.

CORPS de Garde, is a Post in an Army sometimes under Covert, sometimes in the open Air, to receive a Number of Men who are relieved from time to time to watch in their Turns for the Security of some more considerable Post; and it often also is taken for the Men thus watching, who are called the *Corps de Garde*.

CORPUS cum Causa, is a Writ issuing out of the *Chancery*, to remove both the Body and the Record touching the Cause of any Man lying in Execution upon a Judgment for Debt, into the *King's Bench*, &c. there to lie till he have satisfied the Judgment.

CORPUS Callosum, is the upper Part or Covering of a Space made by the joining together of the Right and Left Side of the internal Substance of the Brain. This Space forms the three Ventricles or *Fornamen Ovale*, and its Bottom is the Internal Substance of the two Sides of the *Cerebrum* gather'd as it were into two Bundles, and are called the *Crura* of the *Medulla Oblongata*.

CORPUS Glandulosum, the same with the *Prostata*.

CORPUSCLES, in Natural Philosophy, signify the Minute Parts, or Particles, or Physical Atoms of a Body; and by this Word is not meant *Elementary Parts*, nor the *Hypothetical Principles* of the Chymists, but such Particles; whether of a simple or compounded Nature, whose Parts will not be dissolved, disjoined, or dissipated by ordinary Degrees of Heat.

And that way of Philosophizing which endeavours to explain things, and to give an Account of the *Phænomena* of Nature by the Motion, Figure, Rest, Position, &c. of Corpuscles or Minute Particles of Matter, is by the Honourable Mr. Boyle called very properly the

CORPUSCULAR Philosophy; which was so very Ancient, that both before *Epicurus* and *Democritus*, and even before *Leucippus* taught in Greece, there was a *Phænician* Philosopher that explained Natural *Phænomena* by the Motions and Affections of the Minute *Corpuscles* of Matter, as very old Writers inform us: and therefore this kind of Philosophy should rather be called *Phænician* than *Epicurean*.

The chief Principles of the *Mechanical Hypothesis* or *Corpuscular Philosophy*, Mr. Boyle sums up in these Particulars:

1. They suppose that there is but one Catholick or Universal Matter, which is an extended, impenetrable and divisible Substance common to all Bodies, and capable of all Forms.

2. That this Matter, in order to form the vast Variety of Natural Bodies, must have Motion in some or all its designable Parts; and that this Motion was given to Matter by God the Creator of all things, and has all manner of Directions and Tendencies.

3. Matter must also actually be divided into Parts, and each of these Primitive Particles, Frag-

ments or Atoms of Matter must have its proper Magnitude or Size, as also its peculiar Figure and Shape.

4. They suppose also, that these differently siz'd and shap'd Particles may have as different *Orders* and *Positions, Situations* or *Postures*, from whence great Variety may arise in the Composition of Bodies.

CORRECTOR of the *Staple*, is a Clerk belonging to the *Staple* that Writeth and Recordeth the Bargains of Merchants made there.

CORRIDOR, in Fortification, is the *Covert-way* lying round about the whole Compass of the Fortifications of a Place, between the Outside of the Moat and the Pallisado's.

CORROSIBILITY, is the Power of being corroded, eaten or dissolved by any *Corrosive Menstruum* or Liquor; and the Honourable Mr. Boyle reckons these Qualifications necessary to render any Body *Corrosible*:

1. That it be furnished with Pores of such a Bigness and Figure, that the *Corpuscles* of the *Menstruum* or *Solvent* may enter them, and yet not be much agitated in them, without also giving brisk Knocks or Shakes to the solid Parts which constitute the Pores or Cavities: For sometimes, though the Pores of a Body may be large enough to let in some gross *Corpuscles*, yet if these, for want of Solidity or Rigidity, are too flexible, or are of an *Incongruous Figure* to those Pores, a Dissolution may not ensue; as it happens when pure Spirit of Wine is in the cold put upon Salt of Tartar; or when *Aqua Fortis* is put upon powdered Sulphur.

2. That its consistent *Corpuscles* be of such a Bulk and Solidity as doth not incapacitate them from being disjoined by the Action of the insinuating *Corpuscles* of the *Menstruum*.

3. That the Cohesion of the Parts of the *Corrodible* Body be not so strict, as that they are not separable by the Action of the Dissolvent.

CORROSIO *Chymica*, is a Dissolution of mixed Bodies by *Corrosive Menstruums*.

CORROSIVE *Medicine*, is one that has a Power of Corroding, as Lime, *Lapis Infernalis*, and other Canteries.

CORROSIVENESS, is the Quality that some Liquors which are called *Menstruums*, have of dissolving or corroding Bodies.

And the Attributes or Qualifications which seem proper to render any Liquor *Corrosive*, Mr. Boyle, in his Mechanical Original of this Quality, reckons to be such as these:

1. That the *Menstruum* or dissolving Liquour consist of, or abound with such Particles as are not too big to get in at the Pores or Commissures of the Body to be dissolved; nor yet so small, as readily to pass through them, as the Rays of Light do through Glass; nor must they be unable, by reason of their great Slenderness and Flexibility, to disjoin the Parts they invade.

2. That these *Corpuscles* be of a Shape fitting to insinuate themselves more or less into the Commissures or Pores of the Body, in order to dissociate its solid Parts.

3. That these Particles have also a competent degree of *Solidity*, in order to disjoin the Particles of the Body to be dissolved: And this Solidity differs much from the Bulk of the *Corpuscles* mentioned in the first Requisite; for one thing may be much more solid than another, tho' it have, as to Bulk,

the same Dimensions: Thus the Stalk of a Plant may be as big as a small Iron or a Steel Rod, but the Latter is much silder than the Former.

4. That the Particles of the *Menstruum* be Agile, and advantaged for Motion, in respect of their Shape, or their Smallness, or their Fitness, to have their Action befriended by the Pressure of the Atmosphere, which may help to drive them into the Pores of Bodies, or by the Agitation which these intruding Particles may be fitted to receive in those Pores by the Transcurion of some subtle *Aethereal* Matter.

CORRODENTIA: *Corroding* things, are things which eat up and consume Excremental Flesh with their sharp *Partioles*. Blanchard.

CORRUGANT *Muscles*, according to some, are those that help to knit the Brows when one frowns; but they seem to be only a Part of the *Frontal Muscles* that have their Fibres running in this Place somewhat obliquely.

CORRUGATOR *Supercilii*, is by some Anatomists reckoned as a Muscle of the Eye-brows, helping to knit them when we frown; but it seems to be only a Part of the *Frontal Muscles*, having Fibres in this Place a little oblique.

CORRUPTION, is the Destruction, Extinction, or, at least, the *Cessation*, for a Time, of the proper Mode of Existence of any Natural Body: For whenever any Body loses all, or any of those Accidents which are essentially necessary to the constituting it of such a kind, it is then said to be corrupted or destroyed, and loses its former Denomination, being not now a Body of the Kind it was before. But, as in *Generation*, nothing *Substantial* is produced, so here nothing *Substantial* is lost or destroyed, but only that Modification of the Body which was its Form, and made it be of such a *Species*.

CORTICAL *Part of the Brain*, is the outward Substance of the Brain, full of *Labyrinths* and *Meanders* in the Outside; it is covered with a thin Skin, and is of an Ash-grisly Colour, being, as *Malpighius* saith, only an Heap of little Oval Glands, and full of little Vessels; inwardly the *Medullary Substance* is next to it. Its Use is thought by some to be for the generating Animal Spirits from the Blood, and hence they are conveyed by the *Medullary Substance* to the *Nerves*, and distributed through the whole Body: And the Seat of the Memory and Sleep is placed there by many Anatomists.

CORTIN, in *Fortification*, signifies the Wall or Distance between the Flanks of two Bastions.

CORUSCATION or *Flashing*, is (by the *Cartesians*) an Exhalation spread under a Cloud, which rushing downwards is set on Fire and flasheth.

CORVUS, a Southern Constellation in the Heavens, consisting of seven Stars.

CORYMBUS, in general, signifies the Top of any thing; but among the old Writers about Plants, *Corymbi* were the Bunches or Clusters of Ivy Berries: Some also call the Top of the Stalk of a Plant, when 'tis so subdivided and adorned with Flowers or Fruits that it makes a round Spherical Figure, by this Name *Corymbus*, as the Tops of Leeks, Onions, and of the *Sambucus Aquatica*, &c. and others confound the Word with *Umbella*, which expresses the Flowry Top of such Plants as have their Branches and Flowers spread round into the Form of what our Women now call an *Umbrella*.

But

But among our Modern Botanists it is used for a compounded discous Flower, whose Seeds are not *Pappous*, or do not fly away in Down; such are the Flowers of *Daisies*, *Corn-Marygold*, &c. and therefore the Accurate Botanist Mr. Ray makes one large Genus of Plants to be such as have a compound discous Flower, but without any downy Wings to carry off their Seeds, and these he properly calls

Corymbiferous Plants; and these he distinguishes into,

1. Such as have a Radiate Flower, as the *Flos Solis*, *Calendula*, *Galba*, *Flos Africanus*, *Chrysanthemum*, *Sagetum*, *Butyphalum*, *Pranica*, *Abinthium Umbelliferum*, *Millefolium*, *Bellis Major* & *Minor*, *Parthenium*, *Chamamelum*, &c.

2. Such as have a Naked Flower, as the *Abrotanum Femina*, *Eupatorium Cannabinum femina*, *Cofus Hortorum*, *Ageratum*, *Abinthium*, *Artemisia*, &c.

To which he adds such as he calls

Corymbiferis Affines, i. e. such Plants as seem akin to the *Corymbiferous* Kind, as *Scabiosa*, *Dipsacus*, *Carduus*, *Spherocephalus*, *Eryngium*, &c.

CORYPHE, is the Crown of the Head; also the interior Extremity of the Fingers near the Nails. *Blanchard*.

CORYZA or *Gravedo*, is a Diffusion of a sharp, salt, and thick Humour into the Mouth, Lungs, and Nostrils, from the *Ventricles* of the Brain by the *Olfactory Nerves*; for when it grows thick, it can neither be *Percolated* by the Reins, nor pass from the *Pituitary Glandule* through the *Infundibulum* into the *Veins*, and therefore it distils into the Nostrils by the aforesaid *Nerves*. *Blanchard*.

CO-SECANT, is the Secant of an Arch which is the Complement of another to 90° .

CO-SINE, is the Right Sine of an Arch, which is the Complement of another to 90 Degrees.

COSENAGE, or *Cognations*, is a Writ that lies where the great Grandfather is seized in his Demefne, as of Fee, at the Day of his Death, of certain Lands and Tenements, and dieth, and then a Stranger entreth and abateth; for then shall his Heir have this Writ of *Cosenage*.

COSHERING, in the Feudal Laws; as there were many Privileges inherent by Right and Custom, so were there several then grievous Exactions imposed by the Lords, by a sort of Prerogative or Seigniorial Authority, as to lie and feast themselves and their Followers (called *Coshering*) at their Tenant's Houses.

COSMETICKS, are Medicines which whiten and soften the Skin, or, in general, any thing that helps to promote the External Beauty or good Appearance of the Person that useth it.

COSMICAL, a Term in Astronomy, expressing one of the Poetical Risings of a Star; for a Star is said to *rise Cosmically*, when it rises together with the Sun, or with that Degree of the *Ecliptick* wherein the Sun then abides; and the *Cosmical Setting*, is when a Star sets and goes down in the

West, at the same time as the Sun rises in the East.

COSMOGRAPHY, is a Description of all the several Parts of the visible World, delineating them according to their Number, Positions, Motions, Magnitudes, Figures, and their other Properties. The Two Parts of which are *Astronomy* and *Geography*.

COSSE and *Coffick*, the old Word for *Algebra*.

COST, (in the Plural Number *Cotizes*) a Term in Heraldry, signifying a fourth Part of a *Bend*.

COSTÆ, the Ribs, are those Bones which, with other Parts, makes the *Chest* or *Thorax*; Backward they are connected with the *Vertebre* of the Back; Forward with the *Cartilages* of the Breast Bone: They are Twelve in number on each Side, the Seven upper are called *Costa Vera*, *True*, because their Cartilaginous Ends are received into the *Sinus* of the *Sternum*; the Five lower *Spurious*, because they are shorter and softer; the broader Part of the Rib is called *Palmula*, the straighter towards the *Vertebra*, *Remulus*. The Ribs are crooked like the Segments of Circles, and grow flat and broad as they approach the *Sternum*, but nearer the *Vertebra* they are rounder and thicker, and at those Ends have each a round Head, which being covered with a Cartilage, is received into the *Sinus* in the Body of each *Vertebra*; and at the Neck of each Head there is a small Tubercle, which is also received into the *Sinus* of the Transverse Processes of the *Vertebra*; and as they are thus articulated, the Ribs make an Acute Angle with the lower *Vertebra*. Each one hath a small Canal or *Sinus* running along the under Side, in which lies a Nerve, Vein and Artery: Their Extremities, which are fastened to the *Sternum*, are Cartilaginous, and the *Cartilages* make an Obtuse Angle with the Bony Part of the Rib. These *Cartilages* are harder in Women than Men, that they may the better sustain the Weight of the Breasts.

Dr. Keil observes very well in his *Anatomy*, P. 227. That if the Ribs had been articulated with the Bodies of the *Vertebra* at Right Angles, the Cavities of the Thorax could never have been enlarged in breathing: If each Rib had been a rigid Bone articulated at both Ends to two fix'd Points, the whole Chest had been immoveable. If the Ribs had not been articulated to the Transverse Processes of the *Vertebra*, the *Sternum* could not have been thrust out to that Degree it is now, nor the Cavity of the Thorax increased so much as is requisite in Inspiration; for when the Ribs are pull'd up by the Intercostal Muscles, the Angle which the Cartilages at the *Sternum* make with the Bony Part of the Rib, must be increased, and consequently its Subtense, or the Distance between the *Sternum* and the Transverse Processes, lengthened. Now because the Rib can't move beyond the Transverse Process, on the account of its being articulated with it; therefore the *Sternum* must either be thrust to the other Side, or else outwards: It cannot move to the other Side, because of an equal Pressure upon the same Account there, and therefore 'tis thrust outwards, or the Distance between the *Sternum* and the *Vertebra* is increased: The last Ribs, which do not reach the *Sternum*, and consequently conduce nothing to this Action, are not articulated with the Transverse Processes.

If we suppose the Cavity of the *Thorax* to be half a *Spheroid*, whose *Semi-Axis* is equal to the Height

Height of the *Thorax*, or about 15 Inches, and the Diameter of its greatest Circle 12 Inches, then the Cavity of the *Thorax* will contain about 1130 Cubick Inches; but in an easy Inspiration the *Sternum* is raised $\frac{1}{10}$ of an Inch (as I am assured by an exact Experiment) and therefore on that Account the *Thorax* is enlarged to the Capacity of 1150 Cubick Inches. To this, if we add the Space which the Diaphragm leaves, which is the Segment of a Sphere, whose Diameter is about 15 Inches, and the Solidity of that Segment 183 Inches, we shall have 22 Inches more, if the Diaphragm descends but one Inch; but if it descends an Inch and $\frac{1}{2}$, it then leaves room for 32 Inches of Air more to enter; and if it descends two Inches, the Cavity of the *Thorax* will be increased on the Account of the Motion of the Diaphragm alone to 86 Inches; so that in the least Inspiration which we can fairly suppose, the Lungs are distended with 42 Inches of Air, and sometimes may receive above 70 or 100.

CO-TANGENT, is the *Tangent* of an Arch, which is the Complement of another to 90 Degrees.

COTYLE, the same with *Acetabulum*, is the Cavity of the Huckle Bone, which is appointed to receive the Head of the Thigh Bone.

COTYLEDON, the same with *Cotyle*.

COTYLEDONES, or *Acetabula Uterina*, are Glandules dispersed up and down the utermost Membrane investing the *Fetus*, called *Chorion*, which separate the *Nutritious Juice* from the Womb to nourish the *Fetus*; but this is found only in some Animals; the *Placenta* in the Womb supplies their Place in Women: The gaping meeting of the Veins in the Womb also are called *Cotyledones* and *Acetabula*: These Glandules are so called from the Resemblance they bear to the Leaves of the Herb *Pennywort*, in Latin *Cotyledon*.

COUCHANT, the Term in Heraldry for a Lion born in any Coat of Arms, lying on his Belly, but with his Head erect.

COVENANT, is the Consent of two or more to one thing, to do or give somewhat. *Covenant* is either in *Law* or in *Fact*: A *Covenant in Law*, is that which the Law intendeth to be made, though in Words not to be expressed; as if the Lessee do demise or grant, &c. to the Lessor for a certain Term, the Law intendeth a *Covenant* on the Lessor's Part, that the Lessee shall quietly enjoy his Lease for his Term against all Incumbrances.

Covenant in Fact, is that which is expressly agreed between the Parties. There is also a *Covenant Real*; and a *Covenant merely Personal*; A *Covenant Real* is that whereby a Man tieth himself to pass a thing *Real*, as Lands or Tenements, as a *Covenant* to levy a Fine or Land, &c. A *Covenant merely Personal*, on the other Side, is where a Man covenanteth with another by Deed to build him a House, or any other thing, or to serve him, or to infeof him, &c.

COVENANT is also the Name of a Writ: See *Convoention*.

CO-VERSED *Sine*, is the remaining Part of the Diameter of a Circle, after the Versed Sine is taken from it.

COVERTURE, in Law, is particularly applied to the Estate and Condition of a married Woman, who, by the Laws of our Realm, is *sub potestate viri*, and therefore disabled to make Bargains with any, to the Prejudice of her Self or her

Husband, without his Assent and Privy, or at least without his Allowance and Confirmation; and if the Husband alien the Wife's Lands during the Marriage, she cannot gainsay it during his Life.

COVERT-WAY, in Fortification, is a Space of Ground level with the Field, on the Edge of the Ditch three or four Fathom broad, ranging quite round the Half-Moons and other Works toward the Country: It is otherwise called *Corridor*, and hath a Parapet raised on a Level, together with its *Banquets* and *Glacis*, which from the Height of the Parapet ought to follow the Parapet of the Place till it is insensibly lost in the Field: It hath also a Foot Bank. One of the greatest Difficulties in a Siege is to make a Lodgment on the Covert-way, because usually the Besieged Pallisade it along the Middle, and undermine it on all Sides: This is sometimes called, and that commonly, the *Counter-scarp*, because 'tis on the Edge of it.

COVINE, (in Law) is a deceitful Assent or Agreement between two or more, to the Prejudice of one another.

COUNT, (in Law) signifies as much as the Original Declaration in a Process, though more used in Real than in Personal Actions, as Declaration is more apply'd to Personal than Real.

COUNT-WHEEL, is a Wheel in the striking Part of a Clock, moving round once in 12 or 24 Hours: It is by some called the *Locking Wheel*, because it hath commonly 11 Notches in it at unequal Distances from one another, in order to make the Clock strike 1, 2, 3, 4, &c. 'tis driven round by the *Pinion of Report*.

COUNTER-APPROACHES, in Fortification, are Works made by the Besieged to hinder the Approach of the Enemy; and when they design to attack them in Form.

COUNTER-BATTERY is one raised to play against another.

COUNTER-BREAST-WORK, a Term in Fortification, the same with *Falſe Bray*.

COUNTER-CHANGED, is a Term in Heraldry, when there is a *mutual changing* of the Colours of the Field and Charge in an Escutcheon, by Reason of one or more Lines of Partition. Thus in the Coat of the Famous Chaucer, he beareth *Party per Pale*, *Argent* and *Gules*, a Bend *Counter-changed*, i.e. that Part of the Bend which is in that Side of the Escutcheon which is *Argent*, is *Gules*, and that Part of it which is in the other Side, is *Argent*.

COUNTER-COMPONED, the Herald's Term for a *Bordure*, or any Ordinary which hath two Rows only of *Checkers* of two different Colours; but when it hath three or more, they call it *Checky*.

COUNTER-FORTS, are certain Pillars and Parts of the Walls of a Place, distant from 15 to 20 Foot one from another, which are advanced as much as is possible in the Ground, and join'd to the Height of the *Cordon* by Vaults to support the Way of the Rounds and Part of the Rampart; as also to fortify the Wall, and strengthen the Ground; nevertheless they are not at present much used, except in large Fortifications.

COUNTER-FUGUE, in Musick, is when the *Fugues* proceed contrary to one another.



COUNTER-GUARDS, or *Envelopes*, in Fortification, are large Heaps of Earth in Form of a Parapet, raised above the Moat before the Faces and the Point of the Bastion to preserve them; and then they consist of two Faces, making an Angle Salient, and parallel with the Faces of the Bastion. If they are designed to cover one of the Faces of the Bastion, they are shaped like a Demi-Bastion, with a Parapet on the Face and Capital, but none on the Flank, which must lie open and be exposed to the Fire of the Place; but there are few Places now fortified after this Manner by reason of the excessive Charge it requires.

COUNTERMAND, is where a thing formerly executed, is afterwards, by some Acts or Ceremony, made void by the Party that had first done it.

COUNTER-MARCH, in the Art of War, signifies changing the Face or the Wings of a *Battalion*, and this is done either by *Files* or by *Ranks*.

COUNTER-MARCH by *Files*, is when those Men that are in the Front of the Battalion, go into the *Rear*.

COUNTER-MARCH by *Ranks*, is when the Wings or Flanks of the Battalion change Ground with one another.

COUNTER-MINE, in Fortification, is a Subterraneous Passage made by the Besieged in search of the Enemy's Mine, to give Air thereto, to take away the Powder, or by any other Means to frustrate the Effect of it, though it should even happen to be fired by the Assailants.

COUNTER-PART, a Term in Musick, only denoting one Part to be opposite to another; as the *Bass* is said to be the *Counter-part* of the *Treble*.

COUNTER-PASSANT; when two Lions are born in a Coat of Arms, and one appears to be passing or walking quite the contrary way with the other, the Heralds call it by this Term *Counter-passant*.

COUNTER-PLEA, in Common Law, signifies that which the Demandant alledgeth against a Tenant in Courtsey or in Dower, who prayeth in Aid of the King; or him who hath the Reversion for his better Defence.

COUNTER-POINT, in Musick, is a Term whereby is understood the old Manner of composing Parts, before Notes of different Measure were invented; which was to set Pricks or Points one against another to denote the several Concords; the Length or Measure of which Points was sung according to the Quantity of the Words or Syllables whereto they are apply'd; so that in regard that in composing our Descant we set Note against Note, as the Ancients did Point against Point; the Term *Counter-point* is still retained in these Compositions.

COUNTER-SAILIENT, is when two Beasts are born in a Coat of Arms in a Posture of leaping from each other directly the contrary way.

COUNTERSCARP, in Fortification, is that Side of the Ditch which is next the Camp, or properly the *Talus* that supports the Earth of the *Covert-way*; although by this Term is often understood the *whole Covert-way*, with its *Parapet* and *Glacis*; and so it is to be understood when 'tis said, *The Enemy lodged themselves on the Counterscarp*.

COUNTER Swallow's Tail, is an Out-work in Fortification, in the Form of a single Tenaile, wider next the Place, *i. e.* at the Gorge, than at the

Head, or next the Campaign: The Sides of this *Counter Swallow's Tail* are not so well flank'd from the Place as those of the *true Swallow's Tail*, and therefore 'tis not so good.

COUNTER-TENOR, one of the mean or middle Parts of Musick, so called as it were opposite to the *Tenor*.

COUNTER-TRIPPING; when two Staggs, or other Beasts, are born in a Coat of Arms tripping, *i. e.* in a walking Posture, and the Head of one is to the Tail of the other, the Heralds say they are *Counter-tripping*.

COUNTERS, are Two Parts of a Ship; the *upper Counter* is reckoned from the Gallery to the lower Part of the straight Piece of the *Stern*: The *lower Counter* is between the Transom and lower Part of the Gallery.

COUNTING-HOUSE, in the King's Household: See *Green Cloth*.

COUNTY-COURT, is a Court held every Month by the *Sheriff*, or his Deputy the *Under Sheriff*.

COUPED, is the Herald's Word for any thing in an Escutcheon which is born, cut clear and evenly off, in opposition to its being torn off, which they call *Eraled*: Thus the Arms of *Ulster* which all Barons carry, is a Dexter Hand *Couped* or cut off at the Wrist.

COUPLE Close, a Term in Heraldry, signifying the fourth Part of a *Chevron*: These are never born but in Pairs, except a *Chevron* be between them, saith *Guillem*, but *Bloom* gives us an Instance to the contrary.

COURSE, in Navigation, is that Point of the Compass or Coast of the *Horizon* on which the Ship is to be steered from Place to Place; or rather the Angle between the *Rumb-Line* and the *Meridian*.

COURSES, in a Ship, are her *Main-sail* and *Fore sail*; when the sails under them only without lacing on any Bonnets, they say then she goes under a *Pair of Courses*.

COURT, is a Word that has divers Significations, but in Law 'tis the Place where Justice is judicially administered, of which you find Thirty Two several sorts in *Crompton's Book of Jurisdictions*, well described, and of them most are *Courts of Record*; some be not, and therefore are accounted *Base Courts*, in Comparison of the rest. Besides these, there are also *Courts Christian*, which are so called, because they handle Matters especially appertaining to Christianity; and such as, without good Knowledge in Divinity, cannot be well judged of; and therefore the Judges are Divines, as Archbishops, Bishops, Archdeacons, and the like.

COURT-BARON, is a Court that every Lord of a Mannor hath within his own Precincts: And this Court is twofold; as if a Man having a Mannor in Town, to grant the Inheritance of the Copyholders thereunto belonging to another; this Grantee may keep a Court for the Customary Tenants, and accept Surrenders to the use of others, and make both Admittances and Grants. The other Court is of Free-holders, which is properly called the *Court Baron*, wherein the Suitors, that is, the Free-holders, be Judges, whereas of the other, the Lord or his Steward is Judge.

COURT of Chivalry, or the *Marshal's Court*; the Judges are the *Lord High Constable* and the *Earl Marshal* of England. This Court is the Fountain of Martial Law, and the *Earl Marshal* is not only

all of which may be good *Aperitives*; tho' many assert the giving Filings in Substance, is as good a Way as any.

CROCUS Martis Afringens, Binding Saffron of Steel, is the Filings of Iron deprived of their more Saline Parts, which is done by washing them 5 or 6 times in strong Vinegar, and then calcining them 5 or 6 Hours in a strong Fire in a Pot, or upon a Tile. There are many other ways of preparing this *Astringent Crocus*, but this is a very good one.

CROCUS Metallorum, is a kind of Impure and Opaque Glass of Antimony, of a Liver Colour, whence often called *Hepar*, or Liver of Antimony, made by firing equal Parts of Powder of Antimony, and Salt Petre well mix'd, in an Iron Mortar covered with a Tile. 'Tis kindled by dropping in a Coal of Fire, a great Detonation ensues, which when over, strike the Mortar to make the Matter fall to the Bottom: The shining Part is the *Crocus* or Liver, which must be separated from the Dross, washed and kept for use. Of this usually is made the *Emetick Wine*, or *Vinum Benedictum*, by infusing an Ounce of the *Crocus* powdered, in a Quart of Wine for 24 Hours.

CRONICAL: See *Acronical*.

CROSS, one of the Honourable Ordinaries in Heraldry, containing one fifth of the Field. There is great Variety in its Form, according to the Lines that compose it; but a plain *Cross* is figured thus, by the Name of *Rainsford*. He beareth *Argent*, a *Cross Sable*.

Sometimes there is a Line drawn parallel to the Out-line of the *Cross*, and then the Field is supposed to appear through; this is called a *Cross voided*, and born thus,

He beareth *Argent*, a plain *Cross voided Azure*; and sometimes the *Cross* is couped as well as *voided*.

CROSS-Bar-Shot, is a round Shot or great Bullet, with a Bar of Iron put through it.

CROSS-LETTS, are little plain Crosses, whose Ends also bear the Form of a plain Cross. They are thus Figured, and are frequently born *Fitchee*, that is, pointed at Bottom: *Vid. Fitchee*.



CROSS-Staff, is an Instrument made of Box or Pear-Tree, commonly called the *Fore-staff*, because of taking forward Observations; and may be made also a *Back-staff*, by adding a fourth Vane and Sight. 'Tis used by Seamen to take the Meridian Altitude of the Sun or Stars, in order to find the Latitude; 'Tis also by some used in Surveying, to take *Angles*.

CROSS Jack, in a Ship, is a small Yard slung at the upper End of the Mizzen-Mast under the Top; it hath no *Haliards* nor *Tyes* belonging to it. Its Use is to spread and hale out the Mizzen-Top-Sail Sheets. This is also called the *Cross-Tree-Yard*.

CROSS Piece, is a great Piece of Timber going a-cross the *Bitts* of a Ship, and unto it is the Cable belayed when the rides at Anchor.

CROSS Trees, in a Ship, are 4 Pieces of Timber bolted and set into one another a-cross at the

Head of the Mast: Their Use is to keep and bear the Top-masts up; for the Foot of the Top-mast is always fastened into them. Those who are more nice, call only those two of these Timbers which go athwart Ships, the *Cross Trees*; and then the others they call the *Tressel Trees*.

CROSS Tree Yard, is a Yard standing square just under the Mizzen Top, and to it the Mizzen-Top-fail is fastened below.

CROSSIERS, are four Stars in form of a *Cross*, which serve to shew those that sail in the Southern Hemisphere, the *Antartick Pole*.

CROTAPHICK Artery, so some erroneously call the Tendon of the Muscle called *Crotaphites* or *Temporalis*.

CROTAPHITES: See *Temporalis*.

CROTAPHIUM, a Pain in the Head.

CROTCHET, a Term in *Musick*: See *Notes* and *Time*.

CROWN, in Geometry, signifies a plain Ring included between two concentrick Perimeters, and is generated by the Motion of some Part of a Right Line round a Center, the said moving Part not being contiguous to the Center.

The Area of which will be had, if you multiply its Breadth by the middle Perimeter; for a Series of Terms in Arithmetick Progression being $n \times \frac{a + e}{2}$, i. e. the Sum of the first and last multiplied by $\frac{1}{2}$ the Number of Terms, the middle Element must be $\frac{a + e}{2}$; wherefore that multiply'd by the Breadth or Sum of all the two Terms, will give the Crown.

CROWN-WHEEL, of a Watch, is the upper Wheel next the *Balance*, which, by its Motion, drives it; and this in *Royal Pendulums* is called the *Swing-Wheel*.

CROWN-WORKS, in Fortifications, are certain Bulwarks advanced towards the Field to gain some Hill or rising Ground, being composed of a spacious Gorge, and two Wings that fall on the *Counterscarp* near the Faces of the *Bastion*, so that they are defended by them, and present on the Side of the Field an entire *Bastion* between two *Demi-Bastions*, whose Faces look towards one another. Those Works have also their *Half-Moons*, and are raised only to take up and secure some large Space of Ground, or to defend the Head of a Camp when it is intrenched.

CROWNED Horn-work, is a *Horn-work* with a *Crown-work* before it.

CROW-FEET, in a Ship, are small Lines or Ropes put through the Holes of the *Dead Men's Eyes*, and divided by that Means into 6 or 10, or sometimes more Parts: They are of no use at all, but are there left hanging by the Boat-Swain to make a shew of small Rigging. They are placed at the Bottom of the Back-Stays of the Fore-Top-Mast, Mizzen-Top-Mast, and Gallant-Top-Mast.

There goes also a Rope divided into 2 or 4 Portions from the upper End of the Sprit-Sail-Top-Mast to the Fore-Top-Mast Stay, which they call the *Sprit-Sail Top-Sail Crow-Foot*.

CROWS-FEET, (called also *Callrops* and *Chausse Trapes*) are Irons so made with 4 Points of 2, 3 or 4 Inches long, that which way soever they fall, one Point may be uppermost; the shorter are to strow on Bridges, the longer on the Ground, to gall the Feet of a Body of Horse.

CRUCIBLE, is a Chymical Vessel made of Earth,

Thus, suppose 28 were proposed to be cubed, write it down so that there may be room to write

2 Figures between each Place; as,

If, the *Cube* of 2 or 8, is 8 or 800; then 3 times the Square of 2 (which is 12) multiply'd by 8, gives 96 = 3aab,

which place orderly under the 8, as you

see. Next, 3 times the Square of 8 is 192, and that multiply'd by 2 gives 384 = 3abb, which write also orderly, as you see: And lastly, the *Cube* of 8 is 512, which must be written down so, that the first Figure of it to the Right Hand may stand under 8 in the Root; and then adding all together, you have 21952, the true *Cube* of 28.

If the Number to be *Cubed* had consisted of 3 or more Places, as suppose 285,

You must proceed as before to find the *Cube* of 28; the two first Figures toward the Left-hand, which is 21952; then after that you are to account that Number as the *Cube* of *a*, and go on to find the other Members as follows.

Imagine the next Figure 5 to stand 2 Places farther to the Right-hand, and let that be *b*; and 28 or 280, *a*; proceed therefore thus, 3 times the Square of 28 is 2352, which multiply'd by 5, makes 11760 = 3aab;

write that down therefore as you see: Then say, 3 times the Square of 5 is 75, which multiply'd by 28, gives 2100 = 3bba; write that also down as you see: And lastly, write the *Cube* of 5, which is 125 = bbb, in its proper order, as was shewed above, and then adding all together, the Sum will be 23149125, the *Cube* of 285.

And after the same manner you must proceed on, let the Number to be *cubed* be never so large.

And this Method of the Composition of a *Cube Number*, being well understood, the Extraction of the *Cube Root* will be very easy and intelligible by the following Directions.

Suppose you were to extract the *Cube Root* out of this Number 23149125:

1. Beginning at the Right-hand, make a Prick or Point over the first Figure 5, and then over every third Figure afterwards; as many Points as there are, so many Figures will you have in your Root.

2. Find that *Cubick Number* which is next less than 23 (the first Part of the given *Cube*) which is 8, and place its *Cube Root* 2 in the Quotient; then write down 8 under, and subtract it from 23, and to the Remainder bring down the next *Cube* 149; so will 15149 be the *Resolvend*. And thus have

$$\begin{array}{r} 2 \quad 8 \\ 8 \dots a a a \\ 96 \dots = 3 a a b \\ 384 \dots = 3 a b b \\ 512 \dots \quad b b b \end{array}$$

$$21952 = \text{Cube of } a + b \text{ or of } 28.$$

$$\begin{array}{r} 2 \quad 8 \quad 5 \\ : : : : : \\ 21952 = a a a \\ 11760 = 3 a a b \\ 2100 = 3 b b a \\ \quad b 25 = b b b \\ \hline 23149125 \end{array}$$

$$\begin{array}{r} 23149125 \text{ (28)} \\ 8 \quad a a a \end{array}$$

$$\begin{array}{r} 15249 \text{ Resolvend} \\ 12 = 3 a a \\ 6 = 3 a \end{array}$$

$$126 \text{ Divisor.}$$

you found *a* the first Member of the Root, which is 2 or 200; you must next try to find *b*, (that is) such a Number, as that 3aab, 3abb, and bbb added all together, shall not be greater than 15149 the *Resolvend*, for from that Number it must be subtracted. Since therefore *a* = 2, 3 times *a* will 12, which write down as you see; and multiplying *a* also by 3, it produces 6, which set down under the Former in the order as you see.

Add the two last Numbers together, and they make 126, which is to be called a *Divisor*, and is to divide all the *Resolvend* except the last Figure on the Right-

Hand: Enquire therefore how often you can have 126 in 1514, and though you can have it 9 times and more, yet 9 times will be too much, as you may soon find if you multiply 9, which is *b*, according to the Conditions above mentioned; let therefore the Figure to be placed in the Quotient be 8 = *b*, then, by 8 multiplying 3aa, I find the Product to be 96, which I write down under the *Resolvend* as you see: Also squaring 8, I multiply it by 3a or 6, and the Product, which is 384, I write down also under 96; and then cubing 8, I write 512 under the former Numbers, only one Place more to the Right-hand; and adding all together they make 13952, which subtracted from the *Resolvend* 15149, leaves 1197; to which bringing down the last *Cube* 125, you have 1197125 for a new *Resolvend*: Then for a new *Divisor* tripple *a* or 28, and it makes 84 = 3a, which place under the *Resolvend* one Place backward to the Left-hand: Tripple also the Square of *a* or 28, and the Product 2352 = 3aa write under the last Number 84, a Place yet more backward to the Left-hand, as you see. Add the two last Products together for a new *Divisor*, and write it on the Left-hand of the last *Resolvend*; and since on trial you will find it may be had 5 times in the *Resolvend*, place 5 in the Quotient after 28, then cube 5, and write it under the *Resolvend*: Also square 5, and multiply that Square by 3 times 28, it makes 2100, which write down under 125, only a Place backward to the Left-hand, as you see; then multiply 3 times the Square of 28 by 5, and the Product (which is 11760) subscribe (after the same manner) under 2100. Lastly, add the 3 last found Numbers together, and you will find their Sum to be 1197125, which is exactly the *Resolvend*; and so the Work is over, and 285 the true *Cube Root* of the given Number 23149125.

If the Number be not an exact *Cube*, you must add to the last Remainder as many times 3 Cyphers as you design Decimal Places in the Root, and so proceed as before.

CUBIFORME: See *Cuboides*.

CUBIT, or the *Ulna*, in Anatomy is a long hard Bone with a Cavity in its Middle, and lies on the Inside of the Arm, reaching from the El-

bow to the Wrist; but some make it to consist of two Bones, the one called the *Ulna*, and the other *Radius*.

CUBITÆUS Internus & **externus**, are Muscles of the Wrist, the one serves to bend, the other to extend it.

CUBITÆUS Externus, is one of the Extenders of the Wrist, arising from the External Knob of the *Os humeri*, and is inserted in the upper and external Part of the *Os metacarpi* of the little Finger.

CUBITÆUS Internus, is one of the Benders of the Wrist, springs from the inner Extuberance of the *Os humeri*, and passing along the *Ulna*, ends in the fourth Bone of the *Carpus*, and the *Os metacarpi* of the little Finger.

CUBITAL Muscle: See *Anconens*.

CUBO-Cube, the sixth Power of any Number or Quantity.

CUBOIDES, is the seventh Bone of the *Tarsus* of the Foot; it lies in the same Rank with the *Ossa Cuneiformia*: It is called also *Grandiosum* and *Cubiforme*; behind 'tis joined to the *Os Calcis*, before to the two outer Bones of the *Metatarsus*, and on its inside it is joined to the *Os Cuneiforme*.

CUCULLARIS, and *Trapezius*, is a Muscle of the *Scapula*, so named, because this with its Fellow covering the Back, represents a Cowl. It arises fleshy from the *Os Occipitis*, Tendinous from the *Ligamentum Colli*, and *Apex* of the Spine of the last *Vertebra* of the Neck, and eight superior of the *Thorax*; from which broad Origination becoming Thick and fleshy, it's so inserted to the *Clavicula*, and Tendinous to the *Spina Scapulae*. Each Muscle is Triangular, and both conjointly compose a Lozenge or *Trapezium*, whose large Diameter extends from the *Occiput* to the 15th *Vertebra*; the shorter from near the Extremity of the *Spina Scapulae* on one Side to that of the other. They contain a triple Series of Fibres, the Middle passing directly transverse from the first *Vertebra* of the *Thorax*: Those above descend, and those beneath ascend to their Inferion, whereby the *Scapula* is variously moved according to their Directions, either obliquely upward, directly back, or obliquely down wards.

CUCUPHA, a Medicine for the Head, made of Odoriferous and Cephalick Spices beat to Powder, and stitched between two Pieces of Silk, or else sewed within a Cap, and worn upon the Head against *Catarachs* and other Diseases of the Head. *Blanchard*.



CUCURBITE; so the Chymists call a Glass, Earthen or Copper Body of this Shape, because it something resembles a Gourd. This Vessel, with its *Head*, is most commonly used in Distillations or Rectifications. They call it usually a *Body*.

CUCURBITINI Lumbrici, are broad Worms that breed in the Intestines, like the Seed of a Gourd.

CUCURBITULA, or *Cucurbita*, a *Cupping-Glass*, is a wide hollow Vessel made of Glass or Tin, which is applied to the Body with Scarification or without it, to divert, to drive the Blood into the other Part, or to drive it out: If it be applied without Scarification, it is called *Cucurbita Ceca* and *Ventosa*. *Cupping-Glasses* are applied to the

more fleshy Parts, where the large Vessels and Nerves cannot be hurt. The Drawing, which is performed by these Glasses, is done thus; After the Skin is scarify'd, the Air in the *Cupping-Glasses* is rarify'd and dilated by the Flame of the Tow that is fired within it, which, after it is cooled and condensed, takes up less room than before; so that the External Air pressing upon the Fleth without, forces the Blood into the Glass. There are two sorts of *Cupping-Glasses*, says *Celsus*, one of Brass, and the other of Horn; the Former is open on one Part, and shut on the other; the Latter is equally open on one Part, on the other has a little Hole: Burning Tow is thrown into the Brazen one, and so its Mouth apply'd and forc'd upon the Body till it sticks. That of Horn is apply'd singly by it self, and by a violent sucking at the little Hole, which must presently be stopp'd up close with Wax, it sticks as fast the other; but if either things fail, then a little Cup or Goblet with a streight Mouth may be very fitly apply'd to the same Effect: After it has stuck, if the Skin be scarify'd before with a Pen-knife, it draws out the Blood; if it be whole and entire, it draws out the Flatulent Matter; therefore, where the Matter within is hurtful and offensive, it must be apply'd the former Way; where there is an Inflammation, the Latter. The *Egyptians* at this Day use those of Horn, as appears from *Prosper Alpinus*. *Blanchard*.

Now in England we commonly use *Cupping-Glasses* without Fire, which are evacuated by a small Syringe which works like an Air-Pump; and for Scarification they have an Engine that doth it all at once with great Safety and very little Pain; and this was the Invention of the Ingenious Mr. *Hawksbee* in *Wine-Office Court* in *Fleetstreet*, who makes the best Air-Pumps, and all Pneumatick Engines that ever I saw.

CUDDY, in a first Rate Man of War, is a Place lying between the Quarter-Deck and the Captain Lieutenant's Cabin under the Poop, which is divided into Partitions for the Master and the Secretary's Officers.

CUI ante Divortium, is a Writ that a Woman divorced from her Husband, hath to recover Lands or Tenements from him, to whom her Husband did alienate them during the Marriage, because she could not gainsay it.

CUI in Vita, is a Writ of Entry that a Widow hath against him to whom her Husband aliened her Lands and Tenements in his Life-time; which must contain in it, That during his Life-time she could not withstand it.

CULMIFEROUS Plants, (see *Plants*, N. 23.) are by the *Botanists* accounted such as have a smooth jointed Stalk, and usually hollow; and at each Joint the Stalk is wrap'd about with single, narrow, long, sharp pointed Leaves, and their Seeds are contained in chaffy Husks.

CULMIFEROUS Plants, are of two kinds, either having, 1. a greater, or 2. a smaller Grain or Seed.

CULMIFEROUS Plants, with a greater or larger Seed or Grain, are such as are called *Fru mentaceous* and *Cereales*, because their Seeds are used for Food; as for Bread, Beer, Broth, &c. These they call the *Frumenta*, and are

Spicate,

Earth, and so tempered and baked as to endure the greatest Fire. They are used to melt Metals, to flux Minerals, Oars, &c. and are of this Figure.



A French Crucible.



A German Crucible.

CRUDITY, in Diseases, is when the Blood (as in continued Fevers) is not yet duly fermented and brought to a right Consistence. Crudity of the Stomach, is when Mear, out of a Defect of Nourishment, or some other Cause, is not rightly fermented and turned into Chyle; and it is Threefold, *Apepsia*, *Bradypepsia*, and *Dyspepsia*, of which in their proper Places. *Blanchard*.

CRUOR, Blood: See *Sanguis*. *Helmont* makes a Distinction betwixt *Sanguis* and *Cruor*; the former whereof, he says, is the Blood in the Arteries, the latter, that in the Veins.

CRURA, are the two Heads or Beginnings of the marrowy Substance of the Brain, called *Medulla Oblongata*.

CRURA Medulla Oblongata, the Internal Substance of the two Sides of the *Cerebrum*, gathered together as it were into two Bundles.

CRURAL Artery, by some said to be the Artery of the Thigh, among whose Muscles it divideth it self: It is a Continuation of the *Iliac Artery*, which passing out of the Abdomen, and entering into the Thighs, it loses its former Name, and is called *Cruralis*. Besides some less remarkable Branches, before it come to the Ham, it sends forth the External and Internal Muscle; under the Ham it produces the Two *Poplitea's*, and somewhat lower the *Surales*. Afterwards the Trunk it self is divided into the Branches called *Anterior* and *Posterior*; and the last of these is also subdivided into two smaller Branches which descend to the Foot.

CRURAL Vein; the Blood is conveyed from the lower Extremity of the Body by Six Veins, called, *The greater and smaller Iliaca*, *Muscula*, *Poplitea*, and *Saphena*; which joined together, compose the Trunk of the *Crural Vein*, which ascends to the Groin, and ends in the *Iliaca*.

CRUREUS, or *Femoreus*, is a Muscle of the Leg, so called from its Situation on the Bone of the Thigh, like the *Musculus Branchialis*, on that of the Arm; its Origination is large and fleshy, being continued from between the greater and lesser *Trochanter* of the Thigh Bone forwards to its lower Part; that is, immediately above its Inferior Appendix. Its Fleshy Fibres descend directly, and become perfectly Tendinous a little below the upper Part of the Tendon of the *Rectus*; where it joins with it, and the Tendons of the *Vastus Extremus* and *Internus*, which passes over the external

Part of the *Patella*, (or on each Side of it) and is inserted to a Prominence at the Superior and Fore-Part of the *Tibia*; it helps to extend the *Tibia*.

CRUS, or *Magnus Pes*, is all that Part of the Body which reaches from the Buttocks down to the End of the Toes; and it is divided into the Thigh, Leg and Foot. *Blanchard*.

CRUSTA Laëta, is a Species of *Achor*, Scuit, or crusty Scab, only with this Difference, that an *Achor* infects only the Head, but this not only the Face, but almost the whole Body of an Infant at the time of its first Sucking. *Blanchard*. *Crusta Laëta* turns white, but *Achors* have only one Colour.

CRUSTACEOUS Shell-Fishes, are such as Lobsters, Crabs, Craw-Fishes, &c. which are covered with Shells consisting of several Pieces, and which usually are softer too than those of the *Testaceous Shell-Fishes*, which are all entirely of one Piece, and usually much harder, thicker and stronger than the former; as the Oyster, Scollop, Cockle, &c.

CRUSTULA, is the same as *Echynoma* in the Eye, being a Defect of Blood from the Arteries into the *Tunica Conjunctiva*, occasioned by a Wound, Streak, &c.

CRYMOTES, is a cold shivering Fever, but many Times accompanied with an Inflammation of the inner Parts. *Blanchard*.

CRYSORCHIS, is an absconding of the Testicles in the Belly. *Blanchard*.

CRYSTALLINUS Humor Oculi, called also *Glacialis*, the Crystalline Humour of the Eye, lies immediately next to the Aqueous, within the opening of the *Tunica Uvea*; like a Glass put over a Hole, it collects and refracts the Rays which strike upon it from all Parts: Its Substance is like Glue or the Gum of a Tree, very pellucid, and of a Consistence like melting Wax, which, though it be press'd, does not easily yield and separate. In Men it is shaped like a *Lens* or Convex Glass, which rises thicker in the Middle than at the Edges: This Humour is the least of all three, but is much more solid than any of them; and is clothed with a small Membrane of its own called *Aranæa*, by reason of its Thinness, like to a Spider's Web.

CRYSTALLOIDES Tunica, the same with *Aranæa Tunica*.

CUBATURE, in Geometry, is finding exactly the solid Content of any proposed Body; as the *Quadrature* of a Surface is finding the Area of that Surface. There is a little Book lately written by one *Fantus a Frenchman*, entituled, *De la Cubature de la Sphere*, in which, with great Assurance, he pretends to find Geometrically the Solid Content of any Portion of a Sphere; but how little the Success answers the Boldness of the Title, I leave the Reader to judge.

CUBBRIDGE-HEADS; so sometimes are the *Bulk-Heads* of the *Fore-Castle* and the *Half Decks* called; the one the *Cubbridge-Head before*, the other the *Cubbridge-Head behind*.

CUBE, is a solid Body of six equal Sides, which are all Squares; 'tis one of the five regular Bodies, and its Content is found by multiplying any one Side or Face by the Height: See a Table of the different Weight of a Cubick Inch and Foot of several Bodies under the Word *Weight*.

CUBICAL Artery, by some is said to be a Branch of the *Axillary*.

CUBICK Equations, in *Algebra*, are such whose highest Power consists of three Dimensions, or is a *Cubical Quantity*; as $aaa - 3bba = 2ccc$, where the highest Power of a the unknown Quantity, is a *Cube*.

Our excellent *Harriot* shews the Original of all such kind of Equations, to be either from the continual Multiplication of three Lateral or Simple Equations into one another, after they are first reduced to the Form of Binominals; or else by multiplying a Lateral Equation into a Quadratick; by both which Ways the same Quantity will be produced, as in this Example.

Let $a + b = o$ } by multiplying of which continually, you will produce the following Quantity, viz. $aaa + baa + bca + caa - bda - daa - cda - bcd = o$; which is an Original *Cubick Equation*, as he calls it. And by this Means he shews, That every *Cubick* hath, either Real or Imaginary, three Roots, sometimes all Affirmative, sometimes all Negative, or some Affirmative and some Negative: Of this see more in *Harriot* himself, or in *Dr. Wallis's Algebra*, where he gives a large Account of this Method.

As to the Solution of *Cubick Equations*, though *Harriot*, *Des Cartes*, and others, have given very good Rules, yet no Body hath deduced so easy, natural and demonstrative a Method for it, as the profound *Dr. Wallis* in his *Algebra*, Chap. 46. which he tells us he did in the Year 1647, and is as followeth.

Since *Oughtred* proves, *Ch. 18. Art. 15.* of his *Clavis*; That $Zc = Z + 3\mathcal{A}EZ$, and $Xc = Z - 3\mathcal{A}EX$, they may be reduced thus, $Zc - 3\mathcal{A}EZ = Z$, and $Xc + 3\mathcal{A}EX = Z$: And then he found that $3\mathcal{A}E$ was the triple Rectangle of the two Quantities A and E , whose Sum is Z , and Z the Absolute Number was the Sum of their *Cubes* in the Former, but X the Difference of them, and X the Difference of their *Cubes* in the Latter. And he found also, that all *Cubick Equations* might be reduced to one of these two Forms, for as for these two, $Zc - 3\mathcal{A}EZ = -Z$, and $Xc + 3\mathcal{A}EX = -Xc$, where Z and X are Negative Quantities, they only differ from the Former, in which they are Affirmative, in this, that here X and Z will be Negative Quantities, whereas there they will be Positive.

So that all *Cubick Equations* being reducible to these two Forms, the only Difficulty remaining is this, *Having the Rectangle of two Quantities, with the Sum or Difference of their Cubes, to find the Quantities themselves, and consequently, their Sum and Difference.*

Which is performed by resolving a Quadratick Equation of a solid Root (or one whose Root is a *Cube* or some higher Power.)

For $\frac{\mathcal{A}c}{A} = \frac{\mathcal{A}c}{Ac} = Ec$. $Ac + \frac{\mathcal{A}c}{Ac} = Ac + Ec = Z$, and so $\frac{\mathcal{A}c}{E} = A \frac{\mathcal{A}c}{Ec} = Ac$, and $\frac{\mathcal{A}c}{Ec} + Ec = Ac + Ec = Z$, wherefore (multiplying by Ac or Ec , and then transposing the Terms) $Acc - ZAc = -\mathcal{A}c = Ecc - ZEc$, whose Roots are $\frac{1}{2}Z \pm \sqrt{\frac{1}{4}Z^2 - \mathcal{A}c} = \frac{Ac}{Ec}$

And by the like Process it will be found, that $Ac - \frac{\mathcal{A}c}{Ac} = X = \frac{\mathcal{A}c}{Ec} - Ec$; and consequently, $Acc - XAc = \mathcal{A}c = Ecc + XEc$, whose Roots are $\sqrt{\frac{1}{4}X^2 + \mathcal{A}c} \pm X = \frac{Ac}{Ec}$.

And then will the Sum or Difference of their *Cubick Roots* be $A + E = Z$, and $A - E = X$, the Roots sought in those *Cubick Equations*: That is, $\sqrt{c} + \frac{1}{2}Z + \sqrt{\frac{1}{4}Z^2 - \mathcal{A}c} = A + \sqrt{c}$, $\frac{1}{2}Z - \sqrt{\frac{1}{4}Z^2 - \mathcal{A}c} = A + E = Z$, $\sqrt{c} + \frac{1}{2}X + \sqrt{\frac{1}{4}X^2 + \mathcal{A}c} = A - E = X$.

N. B. If as we said above, the Absolute Quantity be Negative, as $-Z$, or $-X$, the Roots then will be $-A - E = -Z$, and $-A + E = -X$.

How to construct *Cubick Equations* after *Mr. Baker's* Way by the *Parabola*, see *Construction of Equations*.

Mr. Halley (now our Learned Savilian Professor of *Geometry* at *Oxon*) in *Philos. Transact. N. 190.* gives a good Way to extract the Roots of all *Cubick Equations* by the Help of the Tables of Sines.

CUBICAL Number, is that which is produced by the Multiplication of a Square Number by its Root: Thus 64 is a *Cubical Number*, and is made by multiplying 16, the Square of 4, by the Root 4. In *Algebra* the third Power in a Series of Geometrical Proportionals continued, is called a *Cube*, as a is the Root, aa the Square, and aaa the Cube: And All *Cubical Numbers* may be ranged into the Form of *Cubes*, as 8 or 27, whose *Sides* are 2 and 3, and their *Bases* 4 and 9.

Theorem. Every true *Cubical Number* produced from a Binominal Root, consists of these Parts, viz. The *Cubes* of the greater and lesser Parts of the Root, and of 3 times the Square of the greater Part multiplied by the lesser, and of 3 times the Square of the lesser multiplied by the greater.

As is plain from bare Algebraical Multiplication in the following Example.

$$\begin{array}{r} aa + 2ab + bb \\ a + b \\ \hline aaa + 2aab + abb \\ \quad aab + abb + bbb \\ \hline aaa + 3aab + 3abb + bbb \end{array}$$

From whence 'tis very easy to understand both the Composition of any *Cubical Number*, and also the Reason of the Method for extracting the *Cube Root* out of any Number given,

Thus,

Spicate, whose Seed is either,

1. *Larger and more Oblong*, and that easily separated from its Husk by Pounding, or Beating, or Threshing, as *Wheat* (*Triticum*) and *Rye* (*Secale*;) or not so easily parting with its Husk, as *Speltz*, in Latin *Zea*, a sort of Bastard Wheat which grows plentifully in *Italy*, *Germany*, and *France*.

To which they add *Barley* (*Hordeum*) and *Rice* (*Oryza*) which are contained in a thicker Husk than *Wheat* and *Rye*.

2. Whose Seed is close and more round, as *Panick*, which is a Seed much sown in *Germany*, and eaten by the Inhabitants.

Paniculate or *Fubate*, whose Seed is either

More Oblong, as *Avena Oats*; or

Roundish, as *Scordium* and *Milum*.

Paniculate and *Spicate* simul, as the *Indian Maize*.

They reckon also some *Culmiferous Herbs* which are not *Esculent*, or usually eaten by Men; and these also are either

Spicate, as the *Phalaris* (*Canary Grass*) and *Lolium*; or

Paniculate, as the *Lacryma Jobi*.

CULMINATE, is a Word used by Astronomical Writers, to express a Star's or the Sun's being upon the Meridian, or having the greatest Altitude that it can have that Day.

The *Culminating* of any Star, or being on the Meridian, may be found by the Globe thus;

Rectify your Globe and Hour Index, and bring the Star to the Brazen Meridian; then the Index will shew the Time of the Star's *Culminating*.

CULMUS, in Botanicks, is properly the Stalk of Corn or Grass, but of no other Plant, for that is called *Caulis*.

CULVERING, a sort of Ordnance, of which there are the *Extraordinary*, the *Ordinary*, and the *least sized Culvering*.

Culvering Extraordinary has $5\frac{1}{2}$ Inches Bore, 12 Foot long, weighing 4800 Pound Weight; its Load above 12 Pound, carries a Shot $5\frac{1}{2}$ Diameter, weighing 20 Pound Weight.

Culvering Ordinary, is a Size lesser.

Culvering of the least Size, is that whose Diameter is 5 Inches Bore, 12 Foot long, weighing about 4000 l. carries a Shot $3\frac{1}{2}$ Inches $\frac{1}{2}$ Diameter, weighing 14 l. 9 Ounces.

CULVERTAILE, the fastening in of a Ship's *Carlings* into the Beam, is so called.

CUN, or *Cond*, a Sea Term, signifying to direct or guide: To *Cun* a Ship is to direct the Person at Helm how to steer her: See *Cond*.

CUNEIFORME Or, is a Bone so called from the Resemblance which it hath to a Wedge; by the Ancients called *Multiforme*, by reason of the various *Processes* on the Inside and Outside, which renders it rough and unequal: It is situate in the Midst of the *Basis* of the Brain, and is placed under it like a *Basis*, so that it touches upon most of the Bones of the Head and the Upper Jaw. *Blanchard*.

CUNEIFORMIA Ossis, are those Bones of the *Tarsus* of the Foot which are accounted the Fourth, Fifth, and Sixth; and these are so called, because they are large above, and narrow below, like Wedges: They link all three at the Side of one another, having their upper Part Convex, and their

Lower Concave, by which means the Muscles and Tendons in the Sole of the Foot are not hurt when we go. At one End, each hath a *Sinus* receiving *Os Naviculare*, and at the other End they are joined to the three inner Bones of the *Metatarsus*; the inmost of these Bones is the largest, and the middle one the least.

CUNEUS, a Triangular Prism, or a Wedge.

CUPPEL or *Coppel*, an Instrument in Chymistry in the Form of a Dish, made of Ashes well wash'd (to cleanse them from all their Salt) or of Bones thoroughly calcined: Its Use is to try and purify Gold and Silver; which is done by mingling Lead with the Metal, and so exposing it in the *Coppel* to a violent Fire a great while; the Impurities of the Metal will then be carried off in Dross, which Dross is called *Litharge* of either Gold or Silver: 'Tis by the Refiners usually called a *Test*.

CUPPING-GLASSES: See *Cucurbitula*.

CURATIO, is a right Way or Method of finding out by Symptoms and Indications proper Remedies for any Disease, in order to the Recovery of Health. *Blanchard*.

CURCULIO, the same with *Cion*.

CURIA *avisare vult*, is a Deliberation that the Court intends to take upon any Point or Points of a Cause, before Judgment be resolved on.

CURIA *Claustranda*, is a Writ that lieth against him that should fence and close up his Ground, if he refuse or defer to do it.

CURIASSIERS, are Horsemen that wear Armour.

CURSITOR, is an Officer or Clerk belonging to the *Chancery*, that maketh out Original Writs: They are called also *Clerks of the Courts*; and there be of these Twenty four in Number, which have allotted to each of them several Shires, in which they make out such Original Writs, as are by the Subject required, and are a Corporation of themselves.

CURTAIN, in Fortification, is the Front of the the Wall of a fortified Place between two *Bastions*; or the longest straight Line that runs about the Rampart, drawn from one Flank to the other, and bordered with a Parapet five Foot high, behind which the Souldiers stand to fire upon the Covert-way and into the Moat. Besiegers seldom carry on their Attacks against the *Curtain*, because 'tis the best flank'd of any Part.

CURTATION of a Planet, in Astronomy, according to some, is a little Part cut off from the Line of his Interval or Distance from the Sun.

CURTESY of England: See *Courtesy* of England.

CURVATURE, signifies Crookedness.

CURVE, the same with Crooked.

CURVES or *Curvilinear Figures*, are in Geometry, such as are terminated or bounded by *Curved* or *Crooked Lines*: as *Circles* and *Ellipses*; and all *Conick Sections*, *Spherical Triangles*, &c. are *Curves*.

CUSTODE *admittendo*, and *Custode amovendo*, are Writs for the admitting or removing of Guardians.

CUSTODES *Libertatis Angliæ autoritate Parliamenti*, was the Stile wherein Writs and other Judicial Proceedings did run during the late Times of Trouble, viz. from the Murder of King *Charles* the First, till the Usurpation by *Cromwell*, mentioned

tioned and declared traiterous by the *Stat. 12. Car.*
2. *Cap. 3.*

CUSTOM, is (both by Common Lawyers and Civilians, taken to be) a Law or Right not committed to Writing, but established by long use, and by the Consent of our Ancestors hath been, and is daily practised; and 'tis either *General or Particular*: A *General Custom*, is that which is allowed through all *England*. *Particular Custom* is that which belongeth to this or that County, or to this or that Lordship, Town, or City.

CUSTOMS and Services, or *Consuetudinibus et Servitiis*, is a Writ of Right close, which lieth against the Tenant that deforceth his Lord of the Rent or Service due to him: Of this see more at large in the *Old Nat. Brev. Fol. 77.*

CUSTOS Brevium, a Clerk belonging to the Court of *Common-Pleas*, whose Office is to receive and keep all the Writs, and put them upon Files, every Return by it self; and at the End of every Term, to receive of the *Protonotaries* all the Records of the *Nisi prius*, called the *Postea*.

CUSTOS Placitorum Coronæ, seems to be the same with *Custos Rotulorum*.

CUSTOS Rotulorum, is he that hath the Custody of the Rolls, or Records of the Sessions of Peace; and as some say, of the Commissions of Peace it self: He is always a Justice of Peace and *Quorum* in the County where he hath his Office.

CUSTOS Spiritualium, or *Custos of the Spiritualities*, is he that exerciseth Spiritual or Ecclesiastical Jurisdiction in any Diocese during the Vacancy of the See, which, by the Canon-Law, belongs to the Dean and Chapter, but at present with us in *England*, to the Archbishop of the Province by Prescription: Howbeit, divers Deans and Chapters do challenge this by ancient Charters from the Kings of this Land.

CUSTOS Temporalium, the Person to whose Custody a vacant See was committed by the King as Supreme Lord, who as a Steward of the Goods and Profits, was to give account to the *Escheator*, and he into the *Exchequer*: His Trust continued till the Vacancy was supplied by a Successor, who obtained the King's Writ *De Restitutione Temporalium*, which was commonly after Consecration, yet sometimes before.

CUT a Feather; if a Ship hath too broad a Bow, they say she will not *Cut a Feather*: that is, she will not pass through the Water so swiftly as to make it foam or froth.

CUTANEOUS Distempers, such as affect the Skin, as the Itch, or Scab, &c.

CUTANEOUS Glands and Vessels, are such as are placed or terminated in the *Cutis* or Skin.

CUTICLE, *Scarff Skin*, is a Cover of the Skin without Sense, extended outwardly over the whole Skin like a Membrane, full of innumerable small Pores, accommodated to the avoiding of Injuries from Abroad, to the shutting up of the *Cutaneous Vessels*, and to the more accurate perfecting of Tactile Qualities: It is nourished by the Blood; for if it be lost or perished, it comes again, though its Vessels be but little conspicuous. *Blanchard.*

Mr. Luenboeck found by his Microscope, that the *Cuticula* consisted of an infinite Quantity of very small Scales, so minute, that a small Grain of Sand would cover near 200 of them; so that he thinks there are no proper Pores in the Skin, but

that the Moisture comes out under or from between the Scales.

CUTIS, is the Skin of a living Man, but *Pellis* is that which is flead off, and it is the outermost Cover of the whole Body, or a pretty thick Membrane wrought of several Filaments of the Veins and Arteries, Nerves and Nervous Fibres, complicated and interwoven with one another, full of Glandules and Lympheducts, or Vessels that convey away the Vapours and Sweat, abounding with a great Number of Pores here and there, and sensibly perforated in many Places to let in and out, as occasion requires; as at the Mouth, Nostrils, Eyes, Ears, Privities, Fundament, &c. it is thickest of all upon the Head, moderately hard in the Neck and Back, finer in the Face, *Penis*, and outer Skin of the *Scrotum*; thin on the Sides, and thinnest of all on the Lips; in some Places, as the Elbow, Forehead, Soles of the Feet, it sticks very close together. *Blanchard.*

CUTT-BASTION: See *Bastion*.

CUTT-WATER, the Sharpness of the Head of a Ship below the Beak; 'tis so called because it cuts or divides the Water before it comes to the Bow: This is called also the *Knee of the Head*.

CUVETTE, in Fortification, is a deeper Trench about four Fathom broad, which is usually sunk in the Middle of the great dry Ditch till you meet with Water, and serves both to prevent the Besiegers Mining, and also the better to keep off the Enemy.

CYCLE, is a continual Revolution of certain Numbers, which successively go on without any Interruption from the First to the Last, and then return again to the First, and so circulate perpetually. In the Calendar there are three principal Cycles, viz. the *Solar*, the *Lunar*, and the *Cycle of Indiction*.

CYCLE of the Sun, is a Revolution of 28 Years, in which time the same Dominical Letter comes about again in the same Order, and Leap-Years expire, and the 29th Year the *Cycle* begins again: This *Cycle* serves to find the Dominical Letter for any Year past, present, or to come.

To find the Cycle of the Sun.

Rule. To the Year add 9, and divide the Sum by 28, the Remainder is the *Cycle of the Sun*.

Example.

To 1701 add 9, the Sum 1710 divided by 28, the the Residue 2 is the *Cycle of the Sun*.

CYCLE of the Moon, is a Revolution of 19 Years, in which time the New Moons return to the same Days they were on before, and she begins again her Course with the Sun. This was invented by *Meton the Athenian*, and is called the *Golden Number*. That which occasioned probably the pitching upon this Number, was their Observations that the *Lunar Eclipses* happen nearly again on the same Day of the Month 19 Years after the former; of which 'tis easy to give many modern Instances. *Enneadecaterides* is with some the Name of this *Lunar Cycle*.

CYCLE of Indiction, is a Revolution of three *Lustrums* of fifteen Years, after which those who used it began it again. This is more ancient than the precedent ones, and hath nothing to do with

with the Heavenly Motions, being established by Constantine, A. D. 312. Sept. 24. who substituted them in the room of the *Olympiads*: They were so called, according to some Authors, because they denoted the Year that Tribute was to be paid to the Republick. To find this *Indiction*, subtract 312 from the Year given, and divide the Remainder by 15, and omitting the Quotient, what remains is the Year of the *Roman Indiction*.

Example, A. D. 1700

1700 - 312

15) 1388 (92

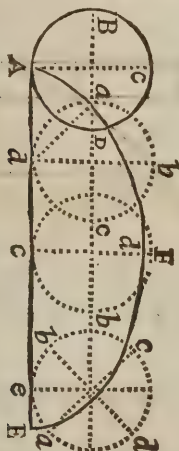
135

38

8 = *Indiction*.

CYCLISCI, are Surgeons Instruments, where-with they scrape away corrupt Flesh, or the like: they are made in the Form of an Half-Moon.

CYCLOID: If on a Right Line, as *AE*, a Wheel or Circle be imagined to make one entire Revolution, or to move till the Point *A* come to touch the Line again at *E*: The Circle will describe the Line *AE*, equal to its Periphery; and the Point



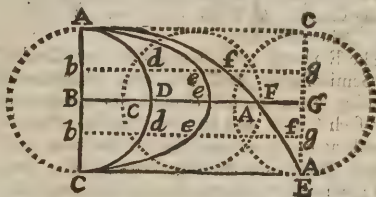
A will describe a Curve Line *AaFE*, which is called a *Cycloid* or *Trochoid*, and the Space contained within this Curve and the Subtense *AE* is called the *Cycloidal Space*.

From the Consideration of which Genes, 'tis very plain, that the Point *a* which describes the Curve, will every where be distant from *d* the Point of Contact, by such a Part of the Circle as is the Distance of that Point of Contact from *A*, the Beginning of the Line. Thus, when *Ad* is a Fourth Part of the whole Subtense, then will *da* be a Quadrant of the Generating Circle; when *Ac* is half that Line, then the Ark *ac* is a Semi-circle, &c. So likewise at the other End, when the Ark *ac* is an Octant, *eE* will be an Eighth Part of the Line *AE*.

Proposition.

Any Semi-ordinate in the Cycloid (or the Right Line *BF*, or *bF*) is equal to its corresponding

Right Sine in the Generating Circle, (as *BD*, *bd*) together with the Arch of that Sine, *AD*, or *ad*.



This is proved from the Consideration of the Manner of the Generation of the *Cycloid* above delivered: For since the Right Line *CE* is equal to the Semi-circular Ark *ADG*, the Right Line *DF* must be equal to the Quadrantal Ark *AD*; for the several Arks of the moving Circle do every where generate Right Lines equal to themselves; wherefore any Semi-ordinate drawn to the Curve of the *Cycloid* must be compounded of *df* or *DF*, viz. a Right Line equal to the Part of the Ark that hath revolved, and of *bd* and *BD* the Right Sine of that Ark in the Generating Circle. *Q. E. D.*

Corollaries.

1. Hence 'tis plain, that by means of the *Cycloid* a Right Line may most easily be found equal to any given Ark of a Circle, or to its whole Circumference; and consequently the Quadrature of the Circle may Geometrically be had, if this *Cycloid* be a true Geometrical Curve, as indeed it is not.

2. If you suppose *de*, *De*, and *de* to be every where drawn equal to the Right Lines *bd*, *BD*, and *bd*; the Curve Line connecting their Extremities will be an Ellipsis (by a Propos. which you will find under the Word *Elliptical Space*) for the whole Aggregate of all these Right Lines, or the Elliptical Space will be double of the Semi-circular one; i. e. as *Be* is to *BB*; and consequently the Curvilinear Space *AeCDA* will be equal to the Semi-circular Space *ADCA*.

3. *DF* (i. e. *De* + *eF*) = Quadrant *DA*, wherefore since the Whole *BG* = to a Semi-circle, the Remainder *BD* + *FG* must also be equal to a Quadrant; but *BD* = *De* (by Cor. 2.) wherefore *eF* will be equal to *FG*; and the same Way of arguing will always prove *ef* above, equal to *fg* below, wherefore all the Indivisibles in each being equal, the Space *eeAfeF* will be equal to the Space *FGE*. Hence,

4. 'Tis plain, that the *Cycloidal Space* is always triple of the Generating Circle.

For the Rectangle *BCEG* is equal to the whole Circle (because on one Side is the Radius, and the other the Semi-circumference,) that is, is equal to the Semi-ellipsis *AeCDA*; wherefore, if out of it you take the Quadrant of the Ellipsis *BeeCB*, what remains, which is the *Trapezium CeGEC*, must be equal to the other Quadrant of the Ellipsis, or to the Semi-circle. But it was proved in Cor. 3. That the Trilinear Space *FGE* was equal

E e to

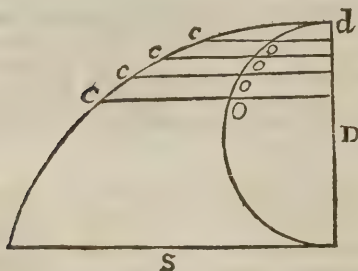
to $eeAff$; wherefore the Trilinear Figure AfF ECA must also be equal to the Semi-circle; and consequently the whole Semi-cycloidal Space AfF CA must be equal to three Semi-circles, and therefore the whole Cycloidal Space triple of the Generating Circle. *Q. E. D.*

Otherwise thus;

The Rectangle AE is equal to two Circles, and the Semi-ellipsis $AeCA$ to one, wherefore the remaining Space $AeCEC$ must also be equal to another such Circle, and its lower half to a Semi-circle, as well as its upper one; but in the lower half, the Figure FGE = to the Figure $eeAff$ in the upper half; wherefore counter-change them, and the Space $CEAFA$ must be equal to a Semi-circle, and consequently the Semi-cycloidal Space equal to three Semi-circles. *Q. E. D.*

The following Demonstration of the same Proposition I had from Mr. Humphry Ditton, who is very skilful in Things of this Nature: 'Tis very short and plain, and depends on the Arithmetick of Infinites. Thus,

The Figure is a Semi-cycloid, where the Arks dO , dO , dO , egc , are supposed to be in Arithmetical Proportions, and consequently so will the Lines co , co , CO , egc , which from the Nature of the Cycloid are all equal severally to those Arks: Now these being a Series of Arithmetical Proportions, will be to as many equal to the greatest, as 1 to



2 (by Prop. 2. of Dr. Wallis's *Arith. Infinit.*) wherefore the Space $CdOS$ = $\frac{1}{2}SD$, but $\frac{1}{2}SD$ = to the whole Circle; wherefore the whole Cycloidal Space CdS must be equal to three Semi-circles. *Q. E. D.*

The *Linea Celerrimi Descensus*, as 'tis called, or the Curve which any heavy Body would describe, supposing it to descend with the greatest possible Swiftneſs, is the Ark of a Cycloid. This John Bernoulli, I think, first proposed, as a Problem to be discovered, and it hath often been solved, but very briefly and easily by Mr. John Craig, in *Philos. Transact.* N. 268. In the *Acta Eruditorum Lips.* for May 1690, p. 217. there is a Method of Investigation for this Line by James Bernoulli.

CYEMA, the same with Embryo.

CYGNUS, the Swan, a Constellation in the Northern Hemisphere, consisting of 35 Stars.

CYLINDER, the Hollow within every Piece of Ordnance, is called her Concave Cylinder.

CYLINDER, is a Solid Body, made by the Rotation of a Rectangled Parallelogram about one of its Sides.

1. Since every Cylinder hath a Circle for its Base, it will be very proper to denote its Base

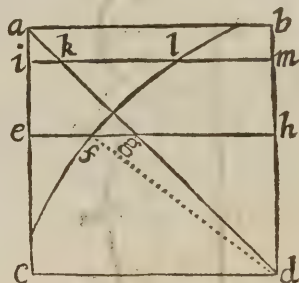
thus, $\frac{1}{2}rdd$ (the Reason of which you have under Circle:.) And then, if the Altitude of the Cylinder be called b (i. e. its height) the Solidity of the Cylinder will be expressed thus, $\frac{1}{2}rddb$.

2. If therefore the Altitudes of any two Cylinders be equal to the Diameters of their Bases, such Cylinders must be to one another, as the Cubes of their Diameters or Altitudes; for here, b the Height being the same with d , the Diameters of the Circle of the Base. If in one Cylinder it be called d , and in the other D , the Solidity of the former will be $\frac{1}{2}rdd$, and of the latter $\frac{1}{2}rDDD$; but doubtless $\frac{1}{2}r$ being a common Efficient or Multiplier: $\frac{1}{2}rdd : \frac{1}{2}rDDD :: ddd : DDD$; that is, the Cylinders are as the Cubes of their Diameters. *Q. E. D.*

3. Every Cylinder is triple of a Cone of the same Base and Height; which see proved in Proposition of Solids.

4. Every Cylinder is to a Sphere inscribed, and of the same Base and Height as 3 to 2.

If the Square and Quadrant with the Diagonal ad , be supposed to revolve round the Axis bd , the Square will generate a Cylinder, the Quadrant an Hemisphere, and the Triangle adb a Cone all of the same Base and Height.



And since Circles are as the Squares of their Diameters, and that the Square of eb (= \square of df) = $\square gb$ (= $\square bd$) + $\square bf$, by 47. e. 1; therefore the Circle described by eb , or its = cd , must be equal to two Circles described by gb , and by bf : Take away then the common Circle, described by bf from both, and there will remain the Circle described by gb = to the Ring described by ef . And thus it will always be, that (v. gr.) the Circle described by km , will be equal to the Annulus or Ring made by the Motion of il ; wherefore all the Rings made by the Revolution of ef, il, egc , must be equal to all the Circles describ'd by the Motion of gb, mk, egc , that is, all the Solid, composed of the Rings made by the Motion of the Parts of the Trilinear Figure $cfbba$, shall be equal to all the Circles generated by the Elements of the Triangle adb : Wherefore since the Cone is $\frac{1}{3}$ of the Cylinder on the same Base and Height, and that the Solid made by the Trilinear $cfbba$, is also another third Part, as being equal to the Cone; the Hemisphere must be $\frac{2}{3}$ of the Cylinder, and consequently, if the Base and Altitude of the Cylinder were equal to the Diameter of the Sphere, the whole Sphere would be $\frac{2}{3}$ of the Cylinder.

Cor. 1. From hence we have the Dimensions of the Sphere and Cylinder, both as to Solidity and Surface; for let d be the Diameter of the Sphere and Cylinder, and $r d$ the Circumference of the Base of the Cylinder; then will the whole Base be $\frac{1}{2} r d d$, (which also is the Area of a great Circle of the Sphere;) and this Base multiply'd by d the Altitude, gives $\frac{1}{2} r d d d$ for the Solidity of the Cylinder; and therefore, by this *Prop.* $\frac{2}{3}$ of that gives the Sphere (*i. e.*) $\frac{2}{3} r d d d =$ Solidity of the Sphere; and that last Quantity divided by $\frac{1}{2} d$ (one Sixth of the Diameter) gives $r d d$ the Surface of the Sphere.

2. Which Surface $r d d$ is manifestly Quadruple of $\frac{1}{2} r d d$, the Area of a great Circle of the Sphere, or the Base of the Cylinder.

3. Wherefore, by multiplying $r d$ (= to the Periphery of the Base of the Cylinder by d the Altitude) you have $r d d$ for the Curve-Surface of the Cylinder; which therefore is equal (taken without its proper Bases) to the Surface of the Sphere; and consequently, adding in the Bases (each of which is $\frac{1}{2} r d d$) the whole Surface of the Cylinder, Bases and all, will be $1 \frac{1}{2} r d d$, that is, to the Surface of the Sphere as 3 to 2.

4. The Square of the Diameter (dd): To the Area of the Circle $\frac{1}{2} r d d$: Is as d : $\frac{1}{2} r d$, (for dd : $\frac{1}{2} r d d$: d : $\frac{1}{2} r d$) that is, as the Diameter to $\frac{1}{2}$ of the Circumference.

5. Because the Solidity of the Cylinder is $\frac{1}{2} r d d d$, therefore the Cone of the same Base and Height will be $\frac{1}{3} r d d d$, which is plainly the Difference between $\frac{1}{2} r d d d$ and $\frac{1}{3} r d d d$, the Solidity of the Cylinder and Sphere; so that the Cone is equal to the Excess of the Cylinder above the Sphere; and the Cone, Sphere and Cylinder are as 3, 2 and 1; so that the Sphere is two Thirds of the Cylinder. See this last proved much shorter under the Word *Indivisibles*.

If you consider a Cylinder, as composed of an infinite Number of Cylindrical Surfaces decreasing (as the Circles of the Base on which they stand) in Arithmetical Progression; if you call the outermost or greatest Surface S , and the Radius of the Base r , the Solidity of the Cylinder will be expressed by $\frac{1}{2} r S$. And it will be diverting to measure a Cylinder by both of these different Ways, in order to see how nearly they will agree.

CYLINDROID, a solid Figure with Elliptical Bases parallel and alike situated.

CYLINDRUS, is a Plaster made oblong, which some Physicians call *Magdaleo*. *Blanchard*.

CYLOSIS: See *Cyllum*.

CYLLUM, signifies a Leg put out of Joint outwardly; also one lame and Crooked.

CYMA, among the Botanists signifies the Top of any Plant or Herb.

CYMATIUM, a Member of Architecture, whereof one Half is Convex, and the other Concave: There are two Sorts of *Cymatiums*, *viz.* one called *Doucires* or *Right Gula*, the most advanced Part of which is Concave; and the other *Talon* or *Reversed Gula*, which hath its most advanced Part Convex, but is hollow below, as the first is above.

CYMBIFORME *Os*: See *Os Naviculare*.

CYNANCHE and *Lynanche*, so called because it is frequently incident to Dogs and Wolves, is an Inflammation of the inner Muscles of the Larynx, accompanied with a Difficulty of Breathing, and a continual Fever. *Blanchard*.

CYNANTHROPIA, is Madness given by a Dog, wherein the Patient flies Light, or any thing that is bright and splendid; fears Water, and trembles at the Sight and Remembrance of it: It proceeds usually from a poisonous Bite, or the like, of some mad Creature, as a Dog, a Wolf, &c. *Blanchard*.

CYNICUS *Spasmus*, the Convulsion of the Muscles of the Mouth, by which the Face is so distorted, that it resembles the Countenance of a grinning Dog.

CYNODES *Orexis*, is a Canine Appetite, or an extreme Hunger join'd with Vomiting or a Looseness: It arises from a too much or a too acid Ferment in the Stomach. *Blanchard*.

CYNODESMUS, is the Band which ties the little Skin of the Yard to the Glands.

CYNODENTES, are those Teeth between the Axle-Teeth and the Grinders, called *Canini*, *Columellares*, and *Oculares*; Eye-Teeth, as we say. *Blanchard*.

CYNOREXIS: See *Cynodes Orexis*.

CYNOSURA, a Constellation consisting of seven Stars; otherwise called *Ursa Minor*, or the *Little Bear*, in the Tail of which is the *Polar Star*.

CYPHER, or *Nought*, thus noted (0), which put before a Figure, signifies nothing (except in Decimal Arithmetick, where it augments, being put before, in the same Proportion as when put after Integers) but after a Figure it increases it by Ten, and so onwards in Decuple Proportion, or by Tens, *ad infinitum*.

CYPHOMA, or *Cyphosis*, Crookedness of the Back.

CYPHOSIS, is the bending of the Vertebres of the Back toward the Back Parts.

CYRTOMA, is a Bunch on the Back, or a Tumor in any other Part.

CYRTOSIS, the same with *Cyrtoma*.

CYSTAROS, is the Gut call'd *Rectum*, the lowermost of all; also the Fundament.

CYSTICA, are Medicines used against Distempers in the Bladder.

CYSTICÆ *Gemelli*, a very small Branch of the *Celiac* Artery dispersed through the Gall-Bladder.

CYSTIS, is the Bladder that holds the Urine or the Gall.

CYSTIS *Choledochus*, the same with *Folliculus felleus*.

CYSTOTOMY, the cutting of a Bladder.

D A M

DACRYODES, are Ulcers which continually send forth Matter. *Blanchard.*

DACTYLE, is the Foot of a *Latin* Verse consisting of three Syllables, whereof the first is long, and the other two short; as *Carmina*.

DACTYLONOMY, is the Art of Numbring on the Fingers.

DADO, a Term in Architecture, by some Writers used for the *Dye*, which is the Part in the Middle of the Pedestal of a Column between its Base and Cornice: 'Tis of a Cubick Form, whence the Name of *Dye* is given to it.

DAILY MOTION of a Planet: See *Diurnal Motion*.

DAMAGE, is generally taken to signify any Hurt or Hindrance that a Man taketh in his Estate; but in Common Law it is Part of that the Jurors be to enquire of, passing for the Plaintiff or Defendant in a Civil Action, be it Personal or Real: For after Verdict given of the principal Cause, they are likewise asked their Consciences (touching Costs, which are the Charges of the Suit, called of the *Civilians*, *Expensa Litis*,) and Damages, which contain the Hindrances that the Plaintiff or Demandant hath suffered, by means of the Wrong done to him by the Defendant or Tenant.

This Word *Damage* (in Law) has two several Significations, the one *Properly* and *Generally*, the other *Strictly* and *Relatively*: *Properly*, as it is in Cases where Damages are founded upon the Statute of 2 H. 4. Cap. 1. and 8 H. 6. Cap. 9. where Costs are included within this Word *Damages*; for *Damage*, in its proper Signification, is said à *Demendo*, when by Diminution a thing becomes worse; and in this Sense, Costs of Suits are *Damages* to the Plaintiff, for by it his Substance is diminished. But when the Plaintiff declares the Wrong done him to the *Damage* of such a Sum, this is to be taken *Relatively*, for the Wrong which is passed before the Writ brought, and are assessed by Reason of the Trespas aforesaid, and cannot extend to the Costs of Suit, which are future, and of another Nature.

DAMAGE CLEERE; *Damna Clericorum* is now assayed by the Tenth Part in the *Common Pleas*, and the Twentieth Part in the *King's Bench* and *Exchequer*, of all *Damages* (exceeding five Marks) recovered either by Verdict, Confession, or Judgment of the Court in all Actions upon the Case, Covenant, Trespas, Battery, false Imprisonment, Dower, and all others wherein *Damages* are uncertain, which the Plaintiff was to pay to the *Prothonotary*, or chief Officer of that Court wherein they are recovered, before he shall have Execution for them. This was Originally only a Gratuity given to the *Prothonotaries*, and their Clerks, for drawing Special Writs and Pleadings, which afterwards grew to a Certainty; but now this is taken away by 17 Car. 2. c. 6. for that it was an unnecessary Charge and Burden upon the King's Subjects.

DAMAGE Feasant, in Common Law, is when Stranger's Beasts are in another Man's Ground without Licence of the Tenant of the Ground, and there do feed, tread, and otherwise spoil the Corn, Grass, Goods, and such like; in which Case the Tenant, whom they *Damage*, may therefore take, distrain, and impound them, as well in the Night as in the Day: But in other Cases, as for Rents and Services, and such like, none may distrain in the Night.

D A V

DAMNATA Terra, is the same with the *Caput Mortuum* of the Chymists, being only the Earth or Mass that remains in the *Retort*, &c. after all the other Principles are forced out by the Fire.

DANCETTE, a Term in Heraldry, when the Out-line of any Bordure or Ordinary is of this Shape, that is, indented in and out very largely, in which only it differs from *Indented*.



There is a bearing of a Bend called double *Dancette*; thus, he beareth *Azure*, a Bend double *Dancette Argent*.



DARKENED Room: See *Obscura Camera*.

DARK Tent, is the Term which some Writers give to a Box made almost like a Desk with Optick Glasses, to take the Prospect of any Building, Fortification, Landskip, &c. This is a Portable *Camera Obscura*, or *Darkened Room*: See the Description under *Obscura Camera*.

DARSIS, is an Excoriation of the Skin. *Blanchard.*

DARTUS, is the second or inner *Tunick* of the common Coats, which immediately cover the Testicles; it arises from the *Membrana Carnosa*, and seems to be Muscular from its Power of contracting and wrinkling it self up; it adheres to the *Tunica Vaginalis* that lies under it by many Membranous Fibres. *Russich* saith, that it hath the *Membrana* also under the *Carnosa Adiposa*.

DASSYMA, is a superficial Inequality of the inner Part of the Eye-lids, accompanied with a Redness. *Blanchard.*

DATA, is the Term in Mathematicks for such Things or Quantities as are supposed to be given or known, in order to find out thereby other Things or Quantities which are unknown or sought for; and *Euclid* uses the Word *Data* (of which he hath a particular Tract) for such Spaces, Lines, and Angles, as are given in Magnitude, or to which we can assign others equal: See *Given*.

DATIVE CASE, is the third Case in the Declension of Nouns, Pronouns, &c. and is so called, because 'tis usually governed by a Verb, which implies something to be given to some Person, and the thing is put in the Accusative Case, and the Person in the *Dative*.

DAVIS's Quadrant, is the common Back-Quadrant: See its Description under the Word *Back-staff*.

DAVIT, a Piece of Timber in a Ship, having a Notch at one End; in which, by a Strap, hangs a Block called the *Fish-Block*: And the Use of this Block is to hale up the Fluke of the Anchor, and to fasten it at the Ship's Bow or Loof. This *Davit* is shiftable from one Side of the Ship to the other, as Occasion serves.

There is a small *Davit* in the Ship's Boat, which is set over her Head with a Shiver, in which is brought the Buoy Rope wherewith to weigh the Anchor; and it is made fast to the Carlings in the Boat's Row.

DAY,

DAY, is either *Natural* or *Artificial*; the former is determined by the Motion of the Sun round the Earth in 24 Hours; the *Artificial* Day is the Time betwixt the Sun's Rising and Setting; to which is opposed *Night*, which is the Time that the Sun is under the Horizon.

The *Natural Day* is also called *Civil*, because it is by divers Nations reckoned divers Ways; the *Babylonians* began to account their Day from the Sun-rising; the *Jews* and *Athenians* from the Sun-setting, whom the *Italians* follow to this Day, beginning their first Hour at Sun-set: The *Egyptians* began at Midnight, as we account our Astronomical Day; but the *Umbri* began at Noon.

The *Natural Day*, beginning at Noon or Midnight, is always equal; but that which is accounted from Sun-rising or setting is unequal; and the *Artificial Day* is every where unequal, but just under the *Equinoctial Line*.

DEAD-MENS-EYES, in a Ship, are a Kind of *Blocks*, having many Holes in them, but no *Shivers*; and through them the *Lanniers* go, which make fast the Shrowds below to the Chains. Sometimes, but rarely, the Main-Srays of a Ship are fet taught by *Dead-Men's-Eyes* and *Lanniers*. The *Crowfeet* always do *reeve* through *Dead-Men's-Eyes*.

DEAD-RECKONING, at Sea, is that Estimation, Judgment, or Conjecture, which the Seamen make of the Place where a Ship is, by keeping an Account of her Way by the *Log*, by knowing the Course they have steered by the Compass, and by rectifying all with Allowance for *Drift*, *Lee*, *Way*, &c. according to the Ship's Trim; so that this Reckoning is without any Observation of the Sun, Moon, and Stars, and is to be rectify'd as often as any good Observation can be had.

DEAD-RISING, a Term in a Ship for that Part of her which lies aft between the Keel and her Floor Timbers, and next adjoining to the Stern-Post under the Bread-Room in a Man of War.

DEAD-WATER, is the Eddy Water just behind the Stern of a Ship; and if a Ship hath a great Eddy follows her Stern, they say *she makes much Dead Water*: This is so called because it doth not pass away so swiftly as the Water running by her Sides doth.

DE BENE ESSE, a Term in Common Law, as when the Defendant's Deposition or Bail is only allowed for the present, but after more full Examination is either to stand or fall.

DEBENTUR, was a Kind of Writing first given in the late Times of the Usurpation to the Soldier, to secure the Payment of his Arrears; 'tis used also in the *Exchequer*; and in the King's House *Debentures* are given usually to the Servants, for the Payment of their Wages, Board-Wages, and the like. The Word is mentioned in the Act of Oblivion, 12 Car. 2. c. 2. and since the late Revolution hath been used in many Acts of Parliament, especially in that which relates to the forfeited Estates in *Ireland*, out of which the Soldier's *Debentures* are appointed to be satisfied, 11 W. 3.

DEBET and *Solet*, is a Writ of Right which hath those Words in it, as formal Words not to be omitted; as if a Man sue for any thing that is now first of all denied, and which hath been enjoyed by himself and his Ancestors before him; as for a Mill, common Pasture, &c. then both *Debet* and *Solet* must be used in the Writ of Right.

DEBILITY, is a Weakness of the Body proceeding from Swooning, Fainting, Hunger, Disease, or otherwise. *Blanchard*.

DEBITO, is a Writ that lieth where a Man ow-

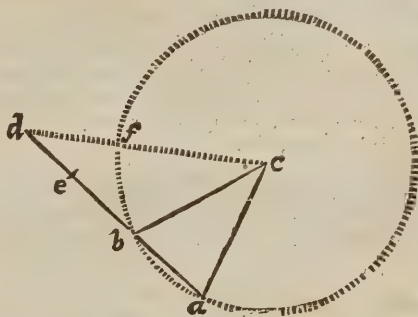
eth Money upon Obligation, or other Bargain for any thing fold unto him.

DEBRUISED, a Term in Heraldry, when a *Pale*, &c. is born upon any Beast in an Escutcheon; for then they say, the Beast is *debruised of the Pale*.

DECAGON, is a plain Figure in Geometry, having 10 Sides and Angles; and if they are all equal to one another, 'tis then called a *Regular Decagon*, and it may be inscribed in a Circle.

Proposition.

The Side of a Regular Decagon is in Power and Length equal to the greatest Segment of an Hexagon, cut according to Extreme and Mean Proportion. 9. e. 13. Euclid.



Let the Line *db*, the Radius or Side of an *Hexagon*, cut into Extrem and Mean Proportion in *e*, (*P. 11. e. 2. Euclid.*) be applied to the Circle in the Point *b*, and then produced till *ba* be the Side of a *Decagon*, or the Chord of 36° .

I say *ba* is equal to *be*, and the $\square ba = be$. Draw *bc*, *ac*, and *dc*.

Demonstration.

The Angle $bca = 36^\circ$, and consequently the equal ones cba and a , each $= 72^\circ$; wherefore dbc must be $= 108^\circ$. Also since $db = bc$, the \angle s d and dcb must be exact $= 36^\circ$. and therefore the whole Angle $acd = 72^\circ$. or the Angle of a Pentagon; wherefore the Δ 's abc and adc are Similar, and consequently $ad : ac :: ac : ab$, that is, $ad : db :: db : ba$; wherefore the whole Line *da* is cut into Extrem and Mean Proportion; and therefore, since *db* is also so divided by the Supposition, the whole Line $da : b d ::$ as the whole Line $db : ba$, but in the same Proportion is bd to be ; wherefore *ba* must be equal to *be*, and the Power of one to the Power of the other.

A Fortification also consisting of 10 Baftions, is sometimes called a *Decagon*.

DECAMP, when an Army raises its Camp, and departs from the Place where it lay before, they say it is *Decamped*.

DECANT; to *Decant* a Liquor, is to pour off the clear Part of it by *Inclination*, as the Chymists speak, that so it may be without any Matter or Sediment; and this Action the Chymists call a *Decantation*.

DECEMTALES: See *Tales*.

DECEPTIONE, is a Writ that lieth against him that deceitfully doth any thing in the Name of another, for one that receiveth Damage or Hurt thereby.

DECIDUOUS, is that which is apt or ready to fall, and is used in reference to the Flowers and Seeds of Plants: Thus the *Botanists* say, in some Plants the *Perianthium* or *Calyx* is *deciduous* with the Flow-

Flower, *i. e.* falls from off the Plant with it; but in others it is not.

DECIES TANTUM, is a Writ which lieth against a Juror which hath taken Money for the giving of his Verdict; called so of the Effect, because it is to recover ten Times so much as he took.

DECIMAL Fraction, is that which hath for its Denominator 1. with a Cypher or Cyphers annexed; as $\frac{6}{10}$, $\frac{46}{100}$, $\frac{46}{1000}$, &c.

Which Denominator, for Brevity and Convenience sake, is most commonly expressed by a Point or a Comma set on the Left-hand of the Numerator; thus, .5 is $\frac{5}{10}$. .46 is $\frac{46}{100}$, and .125 is a Hundred Twenty five Parts of any thing, supposed to be divided into 100 such Parts.

N. B. As Cyphers set on the Right-hand of Integers do increase the Value of them *Decimally*, as 2, 20, 200, &c. so when set on the Left-hand of *Fractions*, they decrease the Value *Decimally*, as .5, .05, .005, &c. but set on the Left-hand of Integers, or on the Right-hand of Fractions, they signify nothing, but only to fill up Places; thus, .5000. or .0005. is but five Units.

1. To reduce any *Vulgar Fraction*, as suppose $\frac{1}{4}$ of a Pound, Shilling, Mile, Yard, Day, Hour, &c. to a *Decimal Fraction* of the same Value, whose Denominator shall be 1000; (I say 1000, for 10 or 100 are not large enough to do it without a Fraction.)

Say, by the *Rule of Three*, As 8 the Denominator of the *Vulgar Fraction* : Is to 5 its Numerator : : So will 1000 the Denominator assigned : Be to a 4th Term, which, by working, you'll find to be .625. and therefore $\frac{5}{8}$, or .625. is a *Decimal* of the same Value with the former Fraction $\frac{5}{8}$.

2. *Addition and Subtraction of Decimals* is performed just as Integers, only Care must be taken about duly placing each Part; as to which be sure to place all the Points one under another, then add or subtract as in common Arithmetick, distinguishing from the Sum or Remainder so many Figures for Decimals, as are the most Decimal Places in any of the given Numbers, as in the following Examples.

In Addition,	.73567	64.58
	.705	97
	.86	.005
	.5	
	2,80067	74.285

In Subtraction, From 35.5
Take 20,98679

Remains 14,51321

From 16.05
Take 10,9999

Remains 5,0501

Multiplication of Decimal Fractions.

General Rule.

'Tis no matter in what Order either Multiplicand or Multiplier stand, only observe, *That there must be just as many Decimal Parts cut off by the separating Point from the Product, as there are Decimals in both Factors*: The Work is just as in Integers.

Example 1. Where one *Decimal* multiplies another.

.365
.22

730
730

.08030

Here the Product is only 8030, but a Cypher is prefix'd to make up the five *Decimal Places*, there being so many in both Factors.

.0006 .464
.5 .9
.00030 .4176

Example 2. Where one Factor is an Integer, the other a *Decimal Fraction*.

4.64 3.65 46.4
9 22 9
417.6 730 417.6
730
80.30

Note, That when a *Decimal Fraction*, or mix'd Number, is to be multiplied by an Unit, with Cyphers annexed thereto, (as 10, 100, 1000, &c.) 'tis only removing the Separatrix so many Places towards the Right-hand in the Multiplicand, as there are Cyphers annexed to the Unit: Thus, if .7652 were to be multiplied by

10 } The Product will be { 7.652
100 } { 76.52
1000 } { 765.2
10000 } { 7652

The Reason of which is, because there can be no more Decimals in the Product, than were in both the Factors; and the Cyphers any where on the Right-hand may be omitted, as being of no Value here.

By *Multiplication*, *Decimals* are reduced to the known Parts of such Integers as they are *Decimals* of, in this manner: Multiply the given *Decimal* by the Number shewing how many known Parts of the next inferior Denomination are equal to that Integer, and pursue this as far as it will go, *v. gr.*

What is the Value of this *Decimal* .8687; that is, .8687 of a Day, or of a Pound Sterling, &c.

.8687 of a Day = 20 h. .8687 of a Pound =
24 (50'. 55". (20 17 s. 4 d. 1 q.

34748 17,3740
17374 12
20,8488 7480
60 3740
50,9280 4,4880
60 4
55,6800 1,9520

To find the Value of any *Decimal* of a Pound of *English Money*, there is this ready Rule in Practice: Suppose it were required to find the Value of .8687 of a Pound; double the first Figure 8, and because 6 (the next Figure) exceeds 5, add the Excess, which is 1, to the former Double, and 'twill make it

it 17; account those for Shillings: Then imagining that 1, by which 6 exceeded 5, to be taken as 10, and to stand before the next Figure 8, it will make 18; from which abate 1, and the Remainder 17 is the Farthings, which make 4d. 1q. so that the Decimal was 17s. 4d. 1q.

Also, 312 of a Pound = 6s. 4d. 3q.

If the Second Figure be just 5, add one to the Shillings, and account the third Figure for the Farthings; if it be less than 5, add nothing to the Shillings, but account it as so many Tens, the third Figure for Farthings.

Division of Decimal Fractions.

General Rule.

Work in all Cases, as in Division of Integers, but only observe, that there be just as many Decimal Places (and no more) in the Divisor and Quotient together, as there were in the Dividend.

22)8,030(3,65	22)8,030(3,65	22)8,030(3,65
66	66	66
143	143	143
132	132	132
110	110	110
110	110	110
0	0	0

In *Decimal Division* there are Nine Cases, all performed by the General Rule with a few Directions, as followeth.

1. To divide a whole Number by a greater whole Number;

To the Dividend add Cyphers at Pleasure, and the Quotient will be all Decimal Parts, according to the Number of Cyphers added:

Thus, if 22 were to be divided by 365.

$$365)22,0000(602,87c.$$

2190

1000

730

270

2. To divide a lesser whole Number by a greater mix'd Number;

Add as many Cyphers to the Dividend, as (at least) there are Places in the Divisor:

$$\text{Thus, } 3,65)22,0000(6,02$$

Here, because there are four Decimal Places in the Dividend (by the annexed Cyphers) and but two in the Divisor, there must be two in the Quotient.

3. To divide a whole Number by a Decimal Fraction, annex (at least) as many Cyphers to the Dividend, as there are Places in the Divisor:

$$\text{Thus, } 3,65)22,0000(6,02$$

Here, there being three Places of Decimals in the Divisor, and but three in the Dividend, there can be none in the Quotient.

4. To divide a mix'd by a whole Number:

$$22)8,030(3,65$$

Here, there being no Decimals in the Divisor, but three in the Dividend, there must be three in the Quotient.

5. To divide a mix'd Number by a mix'd Number:

$$22)80,30(3,65$$

Here, the Dividend having two Places of Decimals, and the Divisor one, there must be one in the Quotient.

6. To divide a mix'd Number by a Decimal Fraction, as if 80,30 were to be divided by 3,65, here add three Cyphers to 80,30 the Dividend, because it may have as many or more Decimal Parts than are in the Divisor, and it will stand

$$\text{Thus, } 3,65)80,30000(22,00$$

730

730,87c.

And because the Dividend hath five Places of Decimals, and the Divisor but three, there must be two in the Quotient.

7. To divide a Decimal by a whole Number:

$$22)8030(365$$

Here needs no Cyphers be annexed, because the Dividend is (apparently) bigger than the Divisor; but because the Dividend has four Places in it, and the Divisor none, a Cypher must be prefixed in the Quotient to supply it, and so the true Quotient will be 3,65.

8. To divide a Decimal by a mix'd Number:

$$3,65)8030(22$$

Here, 'tis plain the Quotient must be 22, because there are four Decimals in the Dividend, and but two in the Divisor.

9. To divide one Decimal by another:

$$22)8030(3,65$$

Here 'tis plain by the General Rule. But sometimes Cyphers must be added to the Dividend, as when the Divisor is bigger than the Dividend:

$$\text{Thus, } 3,65)22,0000(6,02$$

Where six Places of Decimals being in the Dividend, and three in the Divisor, three must also be in the Quotient.

Note, That when any Number (either Decimal or Mix'd) is given to be divided by an Unit, with Cyphers annexed thereto (as 10, 100, 1000, &c.) it is only removing the Separatrix in the Dividend so many Places farther toward the Left-hand, as there are Cyphers annex'd to the Unit, prefixing Cyphers to the Dividend to supply the vacant Places (if need be:)

Thus, if 7562 were to be divided

$$\text{By } \left. \begin{array}{l} 10 \\ 100 \\ 1000 \\ 10000 \\ 100000 \end{array} \right\} \text{The Quotient is } \left\{ \begin{array}{l} 756,2 \\ 75,62 \\ 7,562 \\ ,7562 \\ ,07562 \end{array} \right.$$

DECIMIS Sotoendis pro Possessionibus alienigenarum, is a Writ, or Letters-Patents, yet extant in the *Register*, which lay against those that had farm'd the *Priors Aliens* Lands of the Kings, for the Recovery of the Parish to recover his Tythe of them.

DECK of a Ship, is a Planked Floor on which the Guns lie, and the Men walk to and fro. In great Ships there are three Decks, First, Second, and Third, beginning to account from the lowest; and some also have an *Half Deck*, which reaches from the *Main Mast* to the *Stem* of the Ship. There is also a *Quarter-Deck*, which is from the *Steerage* aloft to the Master's Round-House. There is also sometimes a *Spare Deck*, which is the uppermost of all,

all, and is between the *Main Mast* and the *Missen*: This *Deck* is called also the *Orlop*: Which see.

DECLARATION (in Common Law) is a shewing in Writing the Grief and Complaint of the Demandant or Plaintiff, against the Defendant or Tenant; wherein he is supposed to have received some Wrong; And this ought to be plain and certain, both because it impeaches the Defendant, and also compels him to answer thereto.

DECLENSION, of a Disease, is when it recedes from its Height, and the Patient is beyond Danger: See *Acme*.

DECLINATION Apparent, is the Distance of the apparent Place of a Planet from the Equator.

DECLINATION of the Sun, is the Distance of the Parallel to the Equator which the Sun runs in any Day, from the Equator it self: And this Distance (on the Globe) is reckon'd on the *Meridian*; and according as this Distance is towards either of the Poles of the World, 'tis called *North* or *South Declination*.

To find the Sun's greatest *Declination*; you must, by some very large Quadrant, or such like Instrument, take the Sun's greatest Meridian Altitude, and his least at the two Solstices; the Difference between which is the Double of the Sun's greatest Declination, or the Distance of the Tropicks; wherefore half of it is the thing sought.

To find the Sun's or Star's *Declination* by the *Globe* or *Sphere*; bring the Sun's Place, or the Star to the Meridian, and the Degrees from the Equinoctial there reckon'd either *North* or *South*, are the *Declination* at Noon.

To find the *Declination* of the Sun Trigonometrically, having given his greatest *Declination* and Distance from the next Equinoctial Point:

Say, As the *Rad.* is to the *Sine* of the Sun's Distance from the next Equinoctial Point, so is the *Sine* of the Sun's greatest Declination to the *Sine* of the present Declination.

Example: Suppose the Sun's Distance from the next Equinoctial Point to be $30^{\circ}. 00'$. The greatest Declination $23^{\circ}. 30'$.

Then to the *Sine* of $30^{\circ}. 00'$. 9,698970
add the *Sine* of $23^{\circ}. 30'$. 9,600700

And the Sum (less *Rad.*) = *Sine* } 19,299670
of $11^{\circ}. 30'$.

which is the Sun's present *Declination* required.

How to find the *Declination* of a Planet or Star that hath Latitude, see *Newton's Astron. Britan.* p. 10.

In the *Pythagorean* or *Copernican System*, the Sun's *Declination* is express'd by the Complement of his Distance from the Pole, or by the Distance of the Pole from the Horizon of the Disk, and is called the *Reflection*: And the Proportion to find it is this;

As the *Rad.* to the *Sine* of the Distance of the two Poles of the Ecliptick and the Equator:: So is the *Sine* of the Sun's Longitude to the Co-sine of his Distance from the next Pole: The Complement of which last, is the *Reflection*, the Distance of the Sun from the Horizon of the Disk, or his *Declination*.

DECLINATION of the Mariner's Compass, is its Variation from the true Meridian of any Place. How to find this, see in *Variation*.

DECLINATION True, is the Distance of the True Place of a Planet from the Equator.

DECLINATION of a Wall or Plane for Dials, is an Arch of the Horizon, comprehended either between the Plane and the Prime Vertical Circle,

if you account it from the *East* or *West*, or else between the Meridian and the Plane, if you account it from the *North* or *South*.

There are many ways given by Authors, for finding the *Declination* of a Plane; of which, all those that depend on the Magnetic Needle deserve to be suspected upon many Accounts. The common Method also, by finding the Sun's Horizontal Distance from the Pole of the Plane, is subject to many Errors and Difficulties. Mr. *Oughtred's* way, by a Semi-circle drawn on a Square Board, is the plainest and easiest Method that can be well thought on of that Nature; but then there is Difficulty in setting the Pin truly perpendicular, as well as in placing the Board truly Horizontal; and at the same time is required the Sun's *Declination* and *Azimuth* to be had exactly. The very best way therefore that I ever met with for finding the *Declination* of a Plane, is to get, on a large square Piece of Brass or Wood, a Limb accurately divided into 360 Degrees, and (if it can be) every 5 Minutes; on the Center of which moves an Horizontal Dial, purposely made for the Latitude of the Place, and which hath a small Bit of fine Brass fixed on its Meridian Line, like a fiducial Edge, to cut the Degrees in the Limb. The Use of which is very easy; for at any time when the Sun shines, you need only apply that Side of the Square to the Plane where are 60 Degrees on the Limb; and then setting it as nearly as you can horizontally, turn the Dial about, till it shew exactly the true Hour of the Day (which before must be rightly found, and a Watch set to it) and then will the fiducial Edge cut the Degrees of the Plane's *Declination*; and which way to account it will be easily seen, because the Dial pointing true *North* gives you an Idea of all the Points of the Compass.

And this Method will be of great Use to such, whose Business is to make many Dials in or near the same Latitude.

DECLINATORIES, are Boxes fitted with a Compass and Needle, to take the Declination of Walls for Dialling, &c.

DECLINING Erect Dials, how to make; see *Dial in Erect declining Dials*.

DECLINING Erect Planes: See *Erect declining Planes*.

DECLINING { *Inclining* } *Dials*, are those
 { *Reclining* }
whose Planes neither face directly any of the Four Cardinal Points; nor are they either perpendicular or parallel to the Horizon.

For the describing of these Dials; first make an *Erect* one for the given *Declination*, according to the Direction in *Erect Declining Dials*; then let the Height of the Style above the Substyle be the

{ Difference between } the Co-Latitude and
 Sum of
{ *Inclination*,
 Reclination.

DECLINING { *Reclining* } *Planes*: See *Dial Plan*.
 { *Inclining* }

DECLIVIS Musculus: See *Obliquus descendens seu Declivis*.

DECOCTION, is a boiling of some Plants, Roots, Seeds, &c. for Medicinal Use, being the same as *Apozem*: Which see.

DECORTICATION, the peeling or unhusking of Roots, Seeds, Fruits, &c. or the freeing of them from their Barks, Rinds, Husks, or Shells.

DECORUM or Decency, in Architecture, is a suiting of all the Parts and Ornaments of a Building, so as they shall become the Station; as *Vitruvius* shews, when he speaks of adjusting the several Orders

ders to their Natural Affections; and he, as Mr. Evelyn observ'd, would never have placed a *Corinthian Column* at the Entrance into a Prison, nor one of the *Tuscan Order* before the *Portico* of a Church.

DECREPITATION of *Sea Salt*, or of *Sal Gemma*, is a Word used by the Chymists for a kind of Calcination of Salt thus; an earthen unglazed Pot is heated red hot over the Fire, and then an Ounce of Salt is thrown into it, and the Pot is presently covered; a great cracking Noise arises, whence comes the word *Decrepitation*. If more Salt be to be decrepitated, the Pot must be kept still red hot, and you must proceed as at first. The Design of it is to free the Salt from superfluous Moisture, but it renders the Salt so porous and apt to imbibe the Humidity of the Air, that it must always be kept in a Viol well stopp'd, or else the Air will soon moisten it anew.

DECUPELATION, the same with *Decantation*: Which see.

DECUSSION, a Term in Opticks; is the crossing of any two Lines, Rays, &c. when they meet in a Point, and then go on apart from one another.

DECUSSORIUM, is a Surgeon's Instrument, wherewith the *Dura Mater* being highly prested, is accurately adjoined to the Skull, that the Purulent Matter gathered betwixt the Skull and the Skin, called *dura Meninx*, or *Mater*, may be evacuated by a Hole made with a Surgeon's Instrument, called *Trepandum*. Blanchard.

DE DEONERANDA *pro rata Portionis*, is a Writ that lies where a Man is distrained for Rent that ought to have been paid by others proportionably.

DEDIMUS *Potestatem*; is a Writ whereby a Commission is given to a private Man, for the Speeding of some Act appertaining to a Judge; and by the *Civilians* is called *Delegation*.

DEEDS, in Common Law, signify Writings, that contain the Effect of a Contract made between Man and Man: See more in *Fait*.

DEEP *Sea-Line*, is a small Line to Sound with, when a Ship is in very deep Water at Sea; at the End of it is a piece of Lead, called the *Deep-Sea-Lead*, at the Bottom of which is a Coat of white Tallow, to bring up Stones, Gravel, Sand, Shells, or the like from the Bottom, and to know the Differences of the Ground, which having been before discovered by other Observations, and entred in their Books, they guess by their Soundings what Coasts they are upon, though they cannot see Land. If it happens that no Ground come up upon the Tallow, they guess they are upon *Ouzie Ground*, which they discover by sounding again with a Woollen Cloth upon the Lead, whereby this Ground will be brought up.

DE *Essendo quietum de Tolonio*, is a Writ which lieth for them which are by Privilege freed from the Payment of Toll.

DE *Expensis Militum*, is a Writ, commanding the Sheriff to levy so much a Day for the Expences of a Knight of the Shire; and a like Writ to levy Two Shillings a Day for every Citizen and Burgeis, called *De expensis Civium & Burgensium*.

DEFAULT, in Law is a Non-appearance in Court, without sufficient Cause made out.

DEFECTIVE or *Deficient Nouns*, in Grammar, are such as want either a Number, a particular Case, or are *Indeclinable*.

DEFEIZANCE, signifies (in Law) a Condition relating to a Deed, as an Obligation, Recognizance, or Statute, which being performed by the Obligor or Recognizor, the Act is disabled and annulled, as

if it had never been done. The Difference between a *Proviso* or a Condition in Deed, and a *Defeizance*, is this, That a *Proviso* or Condition is annexed or inserted in the Deed or Grant; whereas a *Defeizance* is usually a Deed by it self.

DEFENCES, in Fortification, are all sorts of Works that cover and defend the opposite Posts, as *Flanks*; *Parapets*; *Casemates*; *Fausse-Brays*: 'Tis almost impossible to fix the Miner to the Face of a Bastion till the Defences of the opposite one are ruin'd: i. e. till the Paraper of its Flank is beaten down, and the Cannon in all Parts that can fire upon that Face which is attacked, are dismounted.

DEFENDANT, a Term in Law, is he that sueth in an Action personal, as Tenant is he which is sued in an Action real.

DEFENDEMUS, a word used in Feoffment or Donation, and bindeth the Donor and his Heir to defend the Donee.

DEFENSIVE, or *Defensive Medicines*, in Surgery, are Remedies applied outwardly to prevent an Inflammation, or any other Symptom that seems to threaten any Part, from arriving so far as to that Part.

DEFERENT, in Astronomy, an imaginary Circle or Orb (in the *Ptolemaick System*) which is there supposed, as it were to carry about the Body of the Planet. 'Tis the same with the *Eccentric*. The two Points where the Epicycle intersects the *Deferent*, are called the *Points of the greatest Elongation*.

DEFICIENT Nouns: See *Defectiue*.

DEFICIENT Numbers, are such, whose Parts added together make less than the Integer, whose Parts they be; as Eight, whose Parts being One, Two and Four, make but Seven; likewise the Parts of Sixteen make but Fifteen, and of Forty five make but Thirty three.

DEFILE, in Fortification, is a straight narrow Lane or Passage, through which a Company of Horse or Foot can pass only in File, by making a small Front, so that the Enemy may take an Opportunity to stop their March, and to Charge them with so much the more advantage, in regard that tho' in the Front and Rear cannot reciprocally come to the Relief of one another. Hence to go off File by File is called *Defiling*.

DEFINITION, is an exact Description, explaining the Nature of a thing by Essential Attributes. And there are three things necessary to make a *Definition* good.

1. It must be Universal; i. e. it must contain the whole Thing defined; therefore (as the Author of the *Art of Thinking* would have it) the common *Definition* of Time to be the Measure of Motion, is not good; for Time may be the Measure of Rest as well as Motion.

2. It must be proper, that is, it must agree with the Thing defined.

3. It must be clearer than the Thing defined, that is, it ought to render the *Idea* of it more plain and distinct; and make us as much as may be to understand the Nature of it, and be serviceable to us to give a Reason of its principal Properties, which is that which we ought chiefly to consider in *Definitions*.

DEFLAGRATION, in Chymistry, is the enkindling and burning of, in a Crucible, a Mixture of Salt or some Mineral Body, with a Sulphurous one, in order to make a Purification of the Salt; or a Regulus of the Mineral; of which see *Sal Prunella* and *Regulus of Antimony*.

DEFLECTION, is the Tendency of a Ship from her true Course by the Reason of Currents, &c. which divert her, and turn her out of her right way.

DEFLUVIUM, is a Distemper in Trees, whereby they lose their Bark; 'tis caused by a sharp Humour, that dissolves the Glew whereby the Bark is fastned to the Wood; and sometimes by too much Drought.

DEFLUXION: See *Catarrh*.

DEGLUTITION, Swallowing, is an Animal Action, whereby Meat chaw'd in the Mouth, or any thing more liquid, descends into the Stomach by the Motion and Contraction of the Fibres of the Gullet. *Blanchard*.

DEGRADATION, is a Term in Painting, which expresses the lessening and rendering confused the Appearance of distant Objects in a Landskip, so as they shall appear there as they would to an Eye placed at that distance from them.

DEGREE, is the 360th Part of the Periphery of a Circle, it is sub-divided into 60 Parts, called *Minutes*, and each of them again into 60 Parts more, called *Seconds*, and so into *Thirds*, &c.

DEGREE Parodick: See *Parodical*.

DEGREES of Fire: The Chymists reckon Four Degrees of Fire. The *first* is made by only 2 or 3 Coals, and is the most gentle Heat of all. The *2d*, is with 4 or 5 Coals, or only just to warm the Vessel sensibly, but so that you may endure your Hand upon it for some Time. The *3d* Degree is when there is Heat enough to make a Pot boil that is full of 5 or 6 Quarts of Water. The *4th* Degree is as great a Heat as can be made in a Furnace; but all these must admit of some Variations, according to the Circumstances of the Operations, Furnaces, Vessels, Quantity of Matter, &c.

DEJECTION, the same with *Ejection*; is going to Stool, or an Evacuation of the Excrements by the Peristaltick Motion of the Guts.

DELEGATES, in Law, are Commissioners delegated or appointed by the King's Commission, to sit upon an Appeal to him in the Court of *Chancery*, and is granted in Three Cases; *First*, When a Sentence is given in an Ecclesiastical Cause by the Archbishop, or his Official. *Secondly*, When a Sentence is given in any Ecclesiastical Cause in Places exempt. *Thirdly*, When Sentence is given in any Admiralty in Suits Civil or Marine, by order of the Civil Law.

DELETERIOUS, or *Delatery Medicines*, are such Things or Particles as are of a poisonous Nature.

DELTA, one of the Abatements of Honour in Heraldry, being a Square in the Middle of the Escutcheon. See *Abatements of Honour*.

DELIGATIO, Swathing, is a part of Surgery that concerns the Binding up of Wounds, Ulcers, broken Bones, &c. and it is either Simple or Compound: The Simple is either equal or unequal; the equal is only round, which swathes the affected Member without any Declension to either Side; the unequal is divided into *Ascia* and *Sima*, which at least differ upon the Account of one being greater and the other less; *Ascia* declines little from a Round, but *Sima* much. There are a great many more Distinctions of Swathing, taken from the Likeness of the Parts which are swathed, or from certain Animals and other Things. *Blanchard*.

DELIQUIUM Animæ, Swoning, the same with *Eclipsis*, *Lipobymia*, *Syncope*, *Aphyxia*, *Lipopsychia*, &c.

DELIQUIUM Chymicum, is either a Distillation by the Force of Fire; or a melting of the Calx, which is suspended in moist Cellars, and a Resolution of it into Lixivious Humour; thus when Salt of Tartar, or any such fixed Alkali is set in a Cellar or some such cool Place in an open Vessel, it will run into a Kind of Water, which the Chymists call *Oil of Tartar per Deliquium*.

DELIRIUM, is a Depravation of the Imagination and Judgment, arising from a tumultuary and disorderly Motion of the Animal Spirits, occasioned by a Fever; whereupon the Persons affected speak several absurd and incongruous things. *Blanchard*.

DELPHINUS, the *Dolphin*, a Constellation in the Northern Hemisphere, containing 10 Stars.

DELTOIDES, is the Name of a triangular Muscle, in Form like the *Greek Letter Δ*; it proceeds from the *Clavicula* or Channel-Bone, from the upper Process of the Shoulder-Blade, and from the Process of the same, which is called *Spiniforme*; and being fastned to the Middle of the *Os humeri*, lifts it directly upwards, or somewhat forwards or backwards, according to the Direction of its differing Series or Fibres.

DELUGE, the same with an Inundation or overflowing of the Earth, either in part, or in the whole, by Water. There have been several very notorious Deluges or Floods, whose Memorials are recorded in History; as that of *Ogyges* which overflow'd almost all *Attica*, and that of *Deucalion* which drowned all *Theffaly* in *Greece*; but the most terrible one that ever was, was that which is usually and very properly called the *Universal Deluge*, or *Noah's Flood*, which overflow'd and destroyed the whole Earth, and out of which only *Noah* and those with him in the Ark escaped.

Men have been very solicitous to account for this dismal Judgment Philosophically, and to discover from whence such an amazing Quantity of Water could come as was necessary to cover all our Globe to the Height of 15 Cubits above the highest Hills, for to that Height, *Moses* saith exprelly, *Gen. vii. 20. the Waters prevailed*; and some have made so bold with him, as to deny there were any Mountains at all before the Flood, though he exprelly mentions them as a Standard for the Height of the Water; and others have denied the Universality of the Deluge, though the Text be as plain as Words can deliver, *That all the Hills over the whole Earth were covered*. Others have had recourse to the shifting of the Earth's Center of Gravity, and so will have its Parts all drowned successively: And our famous Theorist, *Dr. Burnet*, makes an Earth as it were on Purpose to be drowned at that time; which being in the Form of an orbicular Crust on the Face of the *Sea* (as we now call it, for he saith there was none before the Deluge) fell down into the Water, and so drowned its Inhabitants.

Now for my own part, I should not at all be in care how to find Water for such a Catastrophe, if that were all that appeared necessary to enquire after; for I could easily believe, that the Great Creator of the World could soon either educe *Subterranean*, bring down *Supercelestial*, or create Waters on purpose for such an Occasion; for nothing can be too hard for Omnipotence to effect; and I dare not make my Understanding a Judge how far it may be expedient for Him to make use of His Almighty Power without Secondary Causes.

But the Matter lies not here, the *S.S.* tells us, That the Waters of the Deluge came from two Funds, the *Great Deep below* and the *Rains above*; to these therefore we must stick, and look no further. Again, when we look into the Internal Parts of the Earth, even to the Greatest Depth Men have ever digg'd or min'd, we find there that the Body of the Terrestrial Globe is composed of *Strata*, Rows or Layers lying one over another, and which appear to every one that observes them to be Sediments of a Flood; besides, in the Bodies of these *Strata*, though never so solid, may even in-
sed

ed within the Solidity of the firmest Flints, Marble, Stone, &c. we find a prodigious variety of the *Exuvia* or Remains of Fishes, such as their Shells, Teeth, &c. as well Marine ones, as those which live in Lakes and Rivers: And from a due Observation of these, and repeated Considerations upon them, it was, that the Learned and Ingenious Dr. Woodward, Professor of Physick in *Gresham College*, founded what he delivers upon this Subject; which therefore is not so much a *Theory*, as necessary Deductions, and unavoidable Consequences drawn from Matter of Fact.

And from hence it is, and hence only, that he deduces the following *Inferences* relating to the *Universal Deluge*, in his *Natural History of the Earth*; which appear to me very reasonable, and are these.

1. That these Marine Bodies, and the other Spoils of Fresh-water Fishes, were born forth of the Sea by the Universal Deluge, and on return of the Water back again from off the Earth, they were left behind at Land.

2. That during the time of the Deluge, whilst the Water was out upon, and covered the Terrestrial Globe, all the *Stone* and *Marble* of the Antediluvian Earth; all the *Metals* in it; all the Mineral Concretions; and in a Word, all Fossils whatever that had before attained any Solidity, were *totally dissolved*; their Constituent Corpuscles were disjoined, and their Cohesion perfectly ceased; and that the said Corpuscles of those solid Fossils, together with the Corpuscles of these which were not before solid, such as Sand, Earth, and the like; as also all Animal Bodies and Parts of Animals Bones, Teeth, Shells; Vegetables and Parts of Vegetables, Trees, Shrubs, Herbs; and, to be short, all Bodies whatsoever that were either upon the Earth, or that constituted the Mass, if not quite down to the Abyss, yet quite down to the greatest Depths we ever dig; all these, he says, were assumed up promiscuously into the Water, and sustained in it, in such manner, that the Water, and Bodies in it, together made up one common Mass.

3. That at length all the Mass that was thus born up in the Water, was again precipitated and subsided toward the Bottom: And that this Subsidence happened generally according to the Laws of Gravity: That Matter, Body, or Bodies which had the greatest Quantity or Degree of Gravity, subsiding first in order, and falling lowest; that which had the next, or a still lesser Degree of Gravity subsiding next after; and so in their several Courses: That which had the least Gravity sinking not down till last of all, but settling at the Surface of the Sediment, and covering all the rest: That the Matter subsiding thus, form'd the *Strata* of Stone, Earth, Marble, Coal, &c. of which *Strata* lying one upon another, the Terrestrial Globe, or at least as much of it as hath ever been displayed to Human view, doth mainly consist.

4. That the *Strata* of Marble, Stone, and of all other solid Matter attained their Solidity, as soon as the Sand or other Matter, whereof they consist, was arrived at the Bottom, and well settled there; and that all those *Strata* which are solid at this Day, have been so ever since that time.

5. That these *Strata* lying thus one on another, were all originally parallel; and they were plain, even and regular, rendering consequently the Surface of the Earth even and spherical; that they were contiguous, and not interrupted or broken as we find them now; and that the whole Mass of the

Water lay then upon them, above them all, and constituted a Fluid Sphere environing round all the Globe.

6. That after some time, by the Force of an Agent seated within the Earth, these *Strata* were broken on all sides the Globe; that they were *dislocated*, and their Situation varied, being elevated in some Places, and depressed in others; and from hence arose all the Mountains, Valleys, and other Inequalities of our present Earth's Surface; all the Caverns and Grotto's, all the Perpendicular and Horizontal Fissures; the Channel of the Sea, all Islands, &c. In one word, the whole Terrestrial Globe was put, by this Disruption and Dislocation of the *Strata*, into the Condition which we now behold it. *Nat. Hist. of the Earth*. Part 2.

And afterward, in Part the 2d. considering farther this Matter of the Universal Deluge, he concludes from his *Observations*;

1. That the *Deluge* of *Noah* was truly *Universal*, and laid the whole Earth under Water, covering all, even the highest Mountains, quite round the Globe.

2. That at the time of the *Deluge*, the Water of the Ocean was first brought out on the Earth, and that it was immediately succeeded by that of the Abyss, which was also brought out on the Surface of the Globe.

3. That upon the Disruption of the *Strata*, and the Elevation of some, and the Depression of others of them, which followed after that Disruption towards the End of the Deluge, this Mass of Water fell back again into the depressed and lowest Parts of the Earth, into Lakes and other Cavities into the *Alveus* or Channel of the Ocean; and through the Fissures whereby this communicates with the Ocean in the Abyss, which it filled till it came to an *Equilibrium* with the Ocean.

4. That the *Deluge* commenced in the *Spring Season*, the Water coming forth upon the Earth in the Month which we call *May*.

5. That the *Deluge* did not happen from an accidental Concurrence of Natural Causes, but that many things were then done, which never could possibly have been done without the Assistance of a *Supernatural Power*: That the said Power acted in this Matter with *Design*, and with the highest *Wisdom*: And that as the System of Nature was then, and is still supported and established, a *Deluge* neither did nor could happen naturally.

The Learned and Ingenious Mr. *Whiston*, now Mathematical Professor of the University of *Cambridge*, in his *New Theory of the Earth*, supposes, and indeed makes it very probable from several surprising Co-incidences (as the exact Correspondence between the *Solar* and *Lunar* Year, supposing, as he doth, that the Earth moved in a Circular Orbit before the *Deluge*: That the Earth at the Time of the *Deluge* should be in its Perihelion, which is indeed the natural Effect of a Comet's passing by at that time, and drawing it from a Circular to an Elliptical Orbit: And also, That the Moon was then in such a Place of its Orbit, as to be equally attracted by the Earth when the Comet passed by; I say, he renders it very probable) that a Comet descending in the Plane of the Ecliptick towards its Perihelion, passed just before the Earth on the first Day of the *Deluge*: The Consequences of which he thinks would be, That this Comet, when it came below the Moon, would raise a prodigious, vast and strong Tide, both in the small Seas, which, according to his Hypothesis, were in the Antediluvian Earth (for he allows no great Ocean there, (as in ours) and also in the Abyss, which was under the upper Crust of the Earth. This Tide he supposes would rise and increase all the time of the approach of the Comet towards the Earth, and would be at its greatest Height when the Comet

was at its least Distance from it. By the Force of which Tide, and also by the Attraction of the Comet, he judges, that the Abyss must put on an Elliptick, or rather exactly Oval Figure, whose Surface being much larger than the former Spherical one, the outward Crust of the Earth incumbent on the Abyss, must needs accommodate itself to that Figure, which yet it could not possibly do while it held solid and conjoined together; and therefore he concludes, that it must of necessity be extended, and at last broken by the violent Force of the said Tide and Attraction, and consequently have innumerable Gaps and Clefts made quite through it, out of which the included Water of the Abyss must issue, and so help to occasion the *Deluge*.

He supposes further, That this Comet in its Descent towards the Sun, passed so close by the Body of the Earth, as to involve it in its Atmosphere and Tail for a good while, and consequently left a vast Quantity of Vapours both expanded and condensed on its Surface; a great Part of which being very much rarify'd after their first Fall, would be soon drawn up into the Air again, and afterwards fall down on the Earth in vast and prodigiously violent Rains; which was the Cause of the *Forty Days* Rain mentioned by *Moses* in his History of the *Deluge*. But the other great Rain, which with this lasted for 150 Days, was caused (he saith) by the Earth's coming a second time into the Tail of the Comet: And from this double coming of the Earth into, first, the Atmosphere, and then the Tail of the Comet, he supposes half the Water of the *Deluge* to be derived, as the other half came from the Abyss; whose Waters he supposes were continued to be brought out from the Pressure of that Water which came from the Comet, which he thinks would press downwards with a mighty Force, and endeavour to sink the outward Crust of the Earth down into the Abyss, and this would force the Subterranean Water up through the Clefts and Fissures before made in the Crust by the Violence of the Tide above-mentioned. And at last, to remove this vast Orb of Waters again, he supposes a mighty Wind to have arisen, which dried up some, and forced the rest down into the Abyss through the Clefts or Fissures by which it came up in a good measure before; only that a good Quantity indeed retired into the *Abvius* of the great Ocean (now first made) and into lesser Seas and *Lakes*, &c. From the Calculation of this Comet he concludes, That the *Deluge* began on the 17th Day of the Second Month from the Autumnal Equinox (or on the 27th Day of *November*, in the *Julian* Style extended backward) in the 2265th Year of the *Julian* Period, and in the 2349th Year before the Christian *Era*. He asserts also, That the Waters of the *Deluge* were still, calm and free from Commotions, Storms, Winds and Tempests of all sorts, during the whole time the Ark was afloat upon them: That at the *Deluge* the Earth was first divided into two vast Continents almost opposite to one another, and separated by a vast Ocean, as it is now; and also, that since the *Deluge*, there neither hath nor will be any great or general Changes in the State of the World, till a Period be put to the present Course of Nature. How he makes out these things, the Reader will find in his *New Theory of the Earth*, which is very well worth the careful Perusal of every Mathematical and Philosophical Reader.

DEMAINE, or *Demesn*, *Dominicum*, is a French Word, otherwise written *Domaine*, and signifieth, as *Hottoman* saith, *Patrimonium Domini*, in *verbis feudalibus*, *verbo Dominicum*, where, by divers Authorities, he proveth those Lands to be *Dominicum*,

which a Man holdeth originally of himself, and those to be *feodum* which he holdeth of a Superior Lord.

In *England* no common Person hath any *Demains* simply underfoot, for all dependeth either mediately or immediately on the Crown; for when a Man in pleading would signify his Land to be his own, he saith, That he is or was seiz'd thereof in his *Demains*, as of Fee, *Lit. lib. 1. C. 1.* whereby he meaneth, That although his Land be to him and his Heirs for ever, yet it is no true *Demaine*, but dependeth upon a Superior Lord, and he holdeth by Service, or Rent in lieu of Service, and by both Service and Rent,

This Word *Demaine* is diversly taken; sometimes more largely, as of Lands and Tenements held for Life, &c. and sometimes more strictly, as for such only as are generally held in Fee. This Word is sometimes used for a Distinction between those Lands that the Lord of the Mannor hath in his own Hands, or in the Hands of his Lessee, demised upon a Rent for Term of Years or Life, and such other Lands appertaining to the said Mannor, which belongeth to the Free or Copy-holders. And the reason why Copy-hold is accounted *Demains*, is, because they that be Tenants to it, are judged in Law to have no other Right, but at the Will of the Lord; so that it is reputed still, after a sort, to be in the Lord's Hands: And yet in common Speech that is ordinarily called *Demeans*, that is, neither Fee nor Copy. Note also, That *Demains* is sometimes used in a more special Signification, and is opposite to *Frank-Fee*: For Example, Those Lands which were in the Possession of *Edward the Confessor*, are called *Ancient Demaine*, and others be called *Frank-Fee*, *Kitchin*, Fol. 58. And the Tenants which hold any of those Lands, be called *Tenants in Ancient Demaine*, the other *Tenants in Frank-Fee*, and also Tenants of the Common Law; the Reason is, because *Tenants in Ancient Demaine* cannot be sued out of the Lord's Court.

DEMI-BASTION, is a kind of Fortification that hath only one Face and one Flank.

DEMI-CANNON *lowest*, the Name of a great Gun; (the ordinary ones are about 6 Inches bore, 5400 lb. Weight; some 10, some 11 Foot long, and carry a Shot of 30 Pound Weight;) it carries point blank 156 Paces; its Charge of Powder is 14 Pound Weight. There are also two Sizes of Demi-Cannon above this, which are something larger, as the

Demi-Cannon Ordinary, which is 6½ Inches Bore, 12 Foot long, weighs 5600 Pounds; its Charge of Powder is 17 Pounds 8 Ounces, carries a Shot 6½ Inches in Diameter, and whose Weight is 32 Pounds, and the Piece shoots point blank 162 Paces.

Demi-Cannon of the largest size, is 6¾ Inches Bore, 12 Foot long, of 6000 Pounds Weight; its Charge is 18 lb. of Powder, and the Piece shoots point blank 180 Paces.

DEMI-CULVERING, a Piece of Ordnance; the common sort of them are 4½ Bore, 2700 lb. Weight, 10 Foot long, carries a Shot of 10 Pounds 11 Ounces, is charged with 7 Pounds 4 Ounces of Powder, and shoots Point blank 175 Paces.

Demi-Culvering of the lowest Size, is 4½ Inches Bore, 10 Foot long, of 2000 lb. Weight; its Charge is 6 Pound 4 Ounces of Powder; it carries a Ball of 4 Inches Diameter, and of 9 Pound Weight, and its level range is 174 Paces.

Demi-Culvering of the Elder sort is 4¾ Inches Bore, 10 Foot long, and ½ of 3000 lb. Weight; its Charge of Powder is 8 lb. and 8 Ounces, the Ball is 4 Inches ½ Diameter, weighs 12 lb. 11 Ounces, and the point blank Shot 178 Paces.

DEMI-

DEMI-DISTANCE of *Polygons*: See *Polygons*.

DEMI-DITON, a Note in Musick, being the same with *Tierce Minor*: See *Monochord*.

DEMI-GORGE, in Fortification, is half the Gorge or Entrance into the Bastion, not taken directly from Angle to Angle where the Bastion joins to the Cortine, but from the Angle of the Flank to the Center of the Bastion, or Angle the two Cortines would make, were they thus protracted to meet in the Bastion.

DEMI-QUAVER, a Note in Musick: See *Notes and Time*.

DEMISE, (in Law) is applied to an Estate either in Fee-simple, Fee-Tail, or for Term of Life, and so it is commonly taken in many Writs: The King's Death is in Law termed *the Demise of the King*.

DEMOCRACY, is a Form of Government where the supreme Power and Authority is lodg'd in the People, and they chuse all Administrators and Officers.

DEMONSTRATION, is a Chain of Arguments depending on one another, and founded primarily on first and self-evident Principles, or plain Propositions established and proved from them, and at last ending in the invincible Proof of the thing to be demonstrated, as the Conclusion.

DEMURRER, (in Common Law) signifies a kind of Pause upon a Point of Difficulty in any Action. In *Chancery* the Defendant *demurs* to the Plaintiff's Bill, averring it to be defective in such and such a Point; and demands the Judgment of the Court thereupon, whether he shall be compell'd to make any further or other Answer thereunto, &c.

DENEB, the same with *Cauda Lucida* or *Lion's Tail*, a Star so called: Which see.

DENIZEN, (in Law) signifies an Alien that is enfranchised by the King's Charter, and in all respects almost to do as the King's Native Subjects do, viz. to purchase and possess Lands, and to be capable of any Office or Dignity; yet it is short of Naturalization, because a Stranger Naturalized may inherit Lands by Descent, which a Man made only a *Denizen* cannot.

DENOMINATIVES, in Logick, are such Terms as take their *Original* and *Name* from others.

DENOMINATOR of a *Fraction*, is the Number below the Line, shewing the Nature and Quality of the Parts which any Integer is supposed to be divided into: Thus in $\frac{6}{8}$ the Denominator shews you, that the Integer is supposed to be divided into 8 Parts or half Quarters; and the Numerator 6 shews, that you take 6 of such Parts, i. e. three Quarters of the Whole.

DENOMINATOR of any *Proportion*, is the Quotient arising from the Division of the *Antecedent* by the *Consequent*: Thus, 6 is the Denominator of the Proportion that 30 hath to 5, because 5) 30 (6. This is also called the *Exponent of the Proportion* or *Ratio*.

DENSE; that Body is said to be *Dense* or Thick, when it hath more of Matter, in proportion to the Space or Room it takes up, than other Bodies have; and the being under these Circumstances is called the

DENSITY of *Bodies*, as that which produces it, is called *Condensation*.

The Density of Water to Air is, as *Sr. If. Newton* states it, as 800, or 850 to 1, allowing the Mercury in the Barascope 30 Inches; though *Mr. Boyle* and some others make it as 1000, to 1; but I judge the former Proportion comes nearest the Truth.

The Density of Quick-silver to Water is as 13 $\frac{1}{2}$ to 1; and when the Quick-silver is extraordinary

good, as 24 to 1 nearly; and consequently the Density of Quick-silver to Air is as 11617 to 1.

Sir Isaac Newton asserts the Density of the Planets *Sol*, *Saturn*, *Jupiter*, and of our Earth, and the *Moon*, to be as 100, 60, 7 $\frac{1}{2}$, 387, and 700, and concludes the Sun to be a little denser than *Jupiter*, and our Earth 7 times more dense than the *Sun*.

DENTARPAGA: See *Forfex*.

DENTIDUCUM: See *Forfex*.

DENTIFRICE, is a Medicine for the whitening, scouring, and fastning the Teeth, and for strengthening the Gums.

DENTILS, in Architecture, is a Member of the *Ionick Cornice*, square and cut out at convenient Distances, which gives it the Form of a Set of Teeth, and the Original of its Name.

DENTITION, is the Time that Children breed Teeth, which is about the seventh Month, or later; and usually the upper Teeth come first, though in some the under; and amongst these the Fore-Teeth first. *Blanchard*.

DEOBSTRUENT Medicines, Remedies that open Obstructions.

DEODAND, a thing devoted or consecrated to God for the Pacification of His Wrath, in case of Misadventure, whereby any Christian Man cometh to a violent End, without the Fault of any Reasonable Creature; as if a Horse should strike his Keeper, and so kill him; in this Case the Horse is to be a *Deodand*, that is, given to God, that is, to be sold, and distributed to the Poor, for an Expiation of that dreadful Event, though effected by an unreasonable Creature.

DEOPPIATIVE, the same with *Deobstruent Medicines*: Which see.

DEPART, a certain Operation in Chymistry is called the *Depart*, because the Particles of Silver are made by it to depart from Gold, when they were before melted together in the same Mass, and could not be separated any other way.

'Tis done by melting the united Metals together in a Crucible with a strong Fire, and while the Matter is in Fusion, casting it into a Vessel of cold Water, the Mixture will be divided into very small Grains, which being collected again, and having *Aqua fortis* poured on them, the *Menstruum* will dissolve the Silver, but leave the Gold at the Bottom in a Powder; which, after the Solution of the Silver is gently poured off, must be washed to sweeten it. This is intended for a kind of Purification of Gold; but all the Particles of the Silver will scarce be separated from it even this way. The only way to purify Gold exactly, is by Antimony: Which see under *Purification*; if you would pursue this

Depart farther, and get your Silver out of the *Aqua fortis*; put then into an Earthen Pan a Plate of Copper, and on it pour 10 or 12 times as much Water as the Quantity of your impregnated *Aqua fortis*; into which put in the *Menstruum* of *Aqua fortis*, and let the Mixture lie still for some Hours, or till you find the Copper-Plate to be covered all about with the Powder or Precipitate of Silver, and that the Water begins to turn Blue; then filtrate the bluish Water, and this is that which is called *Aqua Secunda*. Dry the Powder of Silver, and melt it into an Ingot in a Crucible, with a little Salt Petre. If you steep a Plate of Iron some Hours in this *Aqua Secunda*, you will have another

Depart; for the *Menstruum* will let go the Copper which it had dissolved, and which made it look Blue, to prey upon the Iron, and you will have your Copper in Powder on the Iron-Plate: And if you filtrate this Dissolution, you may get the Iron out of

it, by laying in it a Piece of *Lapis Calaminaris*, the Iron will depart out and fall to the Bottom in a Powder, and the Stone will be dissolved, or at least as much of it as the *Menstruum* can contain. If you again filtrate this Water, and then pour upon it drop by drop the *Liquor of fix'd Nitre*, the *Lapis Calaminaris* will be precipitated to the Bottom: And lastly, if you filtrate this Water as before, and after having evaporated a Part of it, set the rest in a cool Place, you will have Chrystals of Salt Petre which will burn like the ordinary sort. *Note*, That though the Silver, the Copper, and the Iron could not be gotten perfectly out of the *Menstruum*, yet the *Liquor of fix'd Nitre* will precipitate all the *Lapis Calaminaris*, and the remaining Particles of the Silver, Copper and Iron.

DEPARTER, or *Departure* from a Plea or Matter, is where a Man pleads a Plea in bar of an Action, and being replied thereunto, doth in his Rejoinder shew another Matter contrary to his first Plea, that is called a *Departure from his Bar*: It is applied also to a Plaintiff, who in his Replication shews new Matter from his Declaration. So if a Man plead a general Agreement in Bar, and in his Rejoinder alledge a special one, this shall be adjudged a *Departure* in pleading: So in Trespass, if the Defendant will plead a Discent, and the Plaintiff replies, that after this the Defendant infeoffed him; and the Defendant effoins that this Feoffment was upon Condition, for the Breach whereof he entred; this is a *Departure*, for it is new Matter.

DEPARTURE in *despight of the Court*, is when a Tenant or Defendant appears to an Action, and hath a Day over in the same Term, or is called after, though he had no Day given him, so that it be in the same Term: If he do not appear, but make default, it is a *Departure in despight of the Court*, and therefore he shall be condemned.

DEPHLEGMATED, *i. e.* cleared from its Phlegm or Water, is a Term used by the Chymists to expreſs that any Spirit is pure and unmix'd with Water or Phlegm, which to effect, they *rectify* it, as they call it, that is, distil it over again; and when 'tis fully deprived of all Water and Phlegm, or at least as much of it as it can well be, they say such a Spirit is well *dephlegmated*.

DEPILATORY, an external Medicine that takes away the Hair from any Part of the Body.

DEPOSITION, is the Testimony of a Witness set down in Writing by way of Answer to the Interrogatories exhibited in *Chancery*, where such Witness is called a *Deponent*.

DEPOSITION, in the Sense of the Grammarians, is the Termination of the Dimensions of a Latin or Greek Verse, so as to discover whether it be perfect, redundant or deficient; wherefore in this respect they reckon four kinds of Verses; *Acatalectic*, where no Syllable is wanting at the End; *Catalectic*, where a Syllable is wanting at the End; *Brachycatalectic*, where a Foot is wanting at the End; and *Hypercatalectic*, where a Syllable or two are redundant, and this kind is called also *Hypermetros*.

DEPRESSION of Equation: See *Equation*, N^o 3.

DEPRESSION of the Pole; so many Degrees as you fail or travel from the Pole towards the Zenith, you are said to *depress* the Pole, because it becomes (respectively) as much lower or nearer to the Horizon.

DEPRESSOR *vel Deprimens Auricularum*, a Muscle of the Ear, in Beasts serving to depress or let fall the Ear.

DEPRESSOR Labii Inferioris: It's difficult to

determine whether this be one only, or two Muscles, it lying between the *Depressores Labiorum Communis*, possesses that Part of the lower Jaw called the *Chin*, and ascending with a direct and transverse order of the Fibres, is inserted into the nether Lip, in depressing of which it turns it outwards.

DEPRESSOR Labiorum, is a Muscle that arises Fleihy from the lower Edge of the inferior Jaw Bone laterally, and ascends directly to its *Interiores* at the Angle of the Lips: This, with its Partner and the *Quadrati* acting, expreſs a sorrowful Countenance, in drawing down the Corners of the Mouth and Cheeks.

DEPRESSOR Oculi, is a Muscle of the Eye which arises from the profoundest Part of the Orbit, and passes directly to its Insertion to the opposite Part of the Globe of the Eye.

DEPRIMENS, or *Humilis*, one of the straight Muscles which move the Globe of the Eye; its Use is to pull it downwards.

DEPRIVATION, is a bereaving or taking away; as when a Bishop, Parson, Vicar or Prebend is *deprived* or deposed from his Preferment for any Matter in Fact or in Law; as if a Schismatick or meer Lay-man be presented, admitted, instituted and inducted, this is good Cause of *Deprivation*.

DEPTH of a Squadron or Battalion, is the Number of Men that are in a File; which of a Squadron is three, and of a Battalion generally fix; whence it comes that we say a Battalion is drawn up 5 *deep*, or 6 *deep*.

DEPURATION, is the cleansing of any Body from its excrementitious Dregs, or more gross Parts.

DE quibus sur dissei, is a Writ of Entry: See *Fitzb. Nat. Brev. Fol. 191*.

DERAIGNE, or *Dereigns*, (in Law) signifies the Proof of a thing which one denies to be done by himself, and the Adversary affirms it, defeating and confounding the Assertion of his Adversary, and shewing it to be without and against Reason or Probability.

DESCANT, in Musick, signifies the Art of composing in several Parts, and is threefold, *viz.* *Plain*, *Figurate* and *Double*.

Plain Descant, is the Ground-work or Foundation of Musical Composition, and consists altogether in the ordinary placing of many Concords.

Figurate or *Florid Descant*, is that wherein Discords are concern'd, as well (though not so much) as Concords; and may well be termed the Ornament or Rhetorical Part of Musick, in regard that in this are introduced all the Varieties of Points, Figures, Syncopes, Diversities of Measures, and whatsoever else is capable of adorning the Composition.

Double Descant, is when the Parts are so contrived, that the *Treble* may be made the *Bass*, and on the contrary, the *Bass* the *Treble*.

DESCENSION Oblique: See *Oblique Descension*.

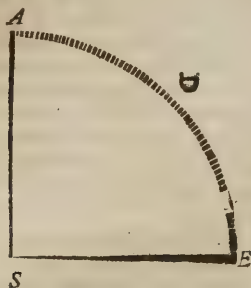
DESCENSION Right: See *Right Descension*.

DESCENSORIUM, a Chymical Furnace, in which Substances are distill'd by Descent, or downwards.

DESCENT in Law: *Vid. Discent*.

DESCENTS, in Fortification, signify the Holes, Vaults, and hollow Places made by undermining the Ground, as the *Counterſcarp* or *Covert-way*; so that a **DESCENT** into the Moat or Ditch, is a deep digging into the Earth of the *Covert-way* in Form of a Trench, of which the upper Part is covered with *Madriers* or Clays against Fires, to secure the Passage into the Moat.

DESCENT of heavy Bodies: If a Body descend from *A* by its proper Gravity, it will come to the Center *S* in the same time as another such like Body by its Revolution shall describe the Quadrant *ADE*. *Princ. Phys. Math. Lib. 1. Prop. 38. Cor. 1.*



Wherefore abstracting from the Resistance of the Medium, all Bodies must needs descend equally swift, and come to the Center from the same Height at the same time, as in Fact is found by Experiment true.

An heavy Body let fall from any Height near the Surface of our Earth, descends in a Second of Time $16\frac{1}{2}$ Feet English, or 197 Inches and $\frac{1}{2}$.

Proposition I.

The Velocities of descending heavy Bodies are proportionate to the Times from the Beginning of their Falls. This follows (saith the Learned Capt. Halley, *Philos. Trans. N. 179.*) because the Action of Gravity being continual, in every Space of Time the following Body receives a new Impulse, equal to what it had before in the same Space of Time received from the first Power; *v. gr.* in the first Second of Time a Body hath acquired a Velocity, which in that Time would carry it a certain Distance; suppose 32 Foot, 2 Inches, and there were no new Force, it would continue to descend at that rate with an equable Motion: But in the next Second of Time, the same Power of Gravity continually acting thereon, superadds a new Velocity equal to the Former, so that at the End of two Seconds, the Velocity is double to what it was at the End of the first; and after the same manner may it be proved to be triple at the End of the third Second, and so on; wherefore the Velocities of falling Bodies are proportionate to the times of their Falls. *Q. E. D.*

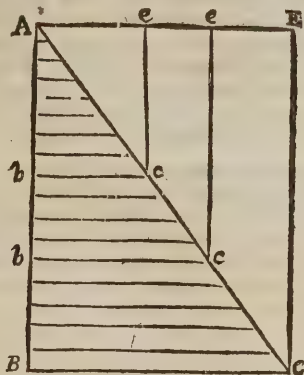
Proposition II.

The Spaces described by the Fall of a Body, are as the Squares of the Times from the Beginning of the Fall.

Demonstration.

Let *AB* represent the Time of the Fall of a Body, *BC*, perpendicular to *AB* the Velocity acquired at the End of the Fall, and draw the Line *AC*; then divide the Line *AB* representing the Time, into as many equal Parts as you please, as *bb b b*, &c. and from these Points draw the Lines *b c*, *b c*, &c. parallel to *BC*; 'tis manifest, that the several Lines *b c* represent the several Velocities of the falling Body, in such Parts of the Time as *Ab* is of *AB*: It is evident likewise, that the Area *ABC* is the Sum of all the Lines *b c* taken together, which ac-

cording to the Method of Indivisibles, are infinitely many; so that the Area *ABC* represents the Sum of all the Velocities, between none and *BC* supposed infinitely many; which Sum is the Space descended in the Time represented by *AB*. And by



the same Reason the Area's *Abc* will represent the Spaces descended in the Times *Ab*; so that the Spaces descended in the Times *AB*, *Ab*, are as the Area's of the Triangles *ABC*, *Abc*; which, by the 20th of the 6th of Euclid, are as the Squares of their Homologous Sides *AB*, *Ab*, that is to say, the Times; wherefore the Descents of falling Bodies are as the Squares of the Times of their Fall. *Q. E. D.*

Proposition III.

The Velocity which a descending Body acquires in any Space of Time, is double to that wherewith it would have moved the Space descended by an equable Motion in the same time.

Demonstration.

Draw *EC* parallel to *AB*, and *AE* parallel to *BC*, and compleat the Parallelogram *ABCE*; it is evident that the Area thereof may represent the Space, a Body moved equally with the Velocity *BC* would describe in the Time *AB*; and the Triangle *ABC* represents the Space described by the Fall of a Body in the same time *AB* (by the foregoing Proposition.) Now the Triangle *ABC* is half the Parallelogram *ABCE*, and consequently the Space described by the Fall, is half what would have been described by an equal Motion with the Velocity *BC* in the same time; wherefore the Velocity *BC* at the End of the Fall, is double to that Velocity which, in the Time *AB*, would have described the Space fallen, represented by the Triangle *ABC* with an equable Motion. *Q. E. D.*

Proposition IV.

All Bodies, on or near the Surface of the Earth, in their Fall descend so, as at the End of the first Second of Time they have described 16 Feet, one Inch, London Measure, and acquired the Velocity of 32 Feet, 2 Inches in a Second.

This is made out from the 25th Prop. of the 2d Part of Mr. Hugenius de Horologio Oscillatorio; wherein he demonstrates the time of the least Vibrations of a Pendulum, to be to the Time of the Fall of a Body from the Height of half the length of the Pendulum,

dulum, as the *Circumference* of a *Circle* to its *Diameter*; whence, as a *Corollary*, it follows, That as the *Squares* of the *Diameter* to the *Square* of the *Circumference*, so half the *Length* of the *Pendulum* vibrating *Seconds*, to the *Space* described by the *Fall* of a *Body* in a *Second* of *Time*; and the *Length* of a *Pendulum* vibrating *Seconds* being found, 39, 125, or 4 Inches, the *Descent* in a *Second* will be found by the aforesaid *Analogy* 16 Foot and one Inch; and by the last *Prop.* the *Velocity* will be double thereto; and near to this it hath been found by several *Experiments*, which, by reason of the *Swiftness* of the *Fall*, cannot so exactly determine its *Quantity*.

From these Four *Propositions* all *Questions* concerning the *Perpendicular Descent* of *Bodies* are easily solved; and either *Times*, *Height*, or *Velocity* being assigned, one may readily find the other two.

From them likewise is the *Doctrine* of *Projects* deducible, assuming the two following *Axioms*, *viz.*

1. That a *Body* set a moving, will move on continually in a *Right Line* with an *equable Motion*, unless some other *Force* or *Impediment* intervene, whereby it is accelerated, or retarded, or deflected.

2. That a *Body* being agitated by two *Motions* at a time, does by their *compounded Forces* pass through the same *Points* as it would do, were the two *Motions* divided and acted *successively*.

The Learned Mathematician Mr. *Keil*, in his Examination of Dr. *Thomas Burnet's Theory* of the *Earth*, P. 124. proves, That the *Direction* of heavy *Bodies* is not towards the *Center* of the *Earth* any where but at the *Equator*, or at the *Poles*: However they will be all perpendicular to their *Horizons*, and so there can be no *Error* in levelling of *Lines*, and in finding the *Risings* and *Fallings* of the *Ground*. And from hence (as he shews, P. 128.) 'tis plain, the *Surface* of the *Earth* cannot be exactly *Spherical*, but the *Earth's Equatorial Diameter* to its *Polar* is as 692 to 689.

DESCRIPTIBENT, a Term in *Geometry*, expressing some *Line* or *Surface* which by its *Motion* produces a *Plain Figure* or a *Solid*: See *Dirigent*.

DESICCATION, is an *Evaporation* of superfluous *Moisture* by *Heat*.

DESICCATIVE Medicines, are the same with *Drying ones*.

DESIRE, is an *Uneasiness* in the *Mind* upon the absence of any Thing whose present *Enjoyment* carries the *Idea* of *Delight* with it; and is greater or less as that *Uneasiness* is more or less vehement.

DE SON Tort Demesne, are Words of *Form* in an *Action* of *Trespas*, used by way of reply to the *Plea* of the *Defendant*, when the *Defendant* says, He did what he did by the *Command* of his *Master*; the *Plaintiff* replies, That the *Defendant* did it *De Son Tort Demesne*, *viz.* of his own *Wrong*, &c.

DESPAIR, is the *Thought* of the *Unattainableness* of any *Good*, which works differently in *Mens Minds*, sometimes producing *Uneasiness* or *Pain*, sometimes *Rest* and *Indolency*.

DESPOTICK, is the same as absolutely *Supreme*, as when a *Prince* has gain'd such an *Absolute* and *Despotick Power*, that he will not be regulated by the *Laws* of his *Country*, but will govern only by his sole *Will* and *Pleasure*.

DESPUMATION, is a Term in *Pharmacy*, and signifies the clearing and cleansing of any *Liquor*, by letting it boil so as to take off the *Scum*.

DESSEIN, (in *French*) signifies two things in *Painting*, either in general, the *Design* or *Thought* that the *Painter* had about any great *Piece*, whether there be drawn only the *Out-lines* (or *Contours*;

or whether he hath proceeded farther to put in the *Shadows* or the *Colours*; and if there appear much *Masterly Skill* or *Judgment* in the *Thought* or *Design*, we say the *Design* was *Great* and *Noble*, &c.

It also signifies the just *Measures*, the *Proportions* and *external Forms* which those *Objects* ought to have that are drawn in *Imitation* of *Nature*; and in this Sense 'tis one of the *Parts* of *Painting*, and may be called a *just Imitation* of *Nature*.

DESTILLATION, is an *Extraction* of the moist or unctuous *Parts* which are rarified into *Vapour* or *Smoke*, as it were, by the *Force* of *Fire*.

Destillation is performed *per Vesicam*, i. e. in a *Cucurbit* (before describ'd) by a *Retort*; by *Deliquium*, by *Filtre*, by *Descent*, &c. and that either in *Bainne Maria*, *Sand*, *Vapours*, *Dung*, the *Sun*, a *Reverberatory*, &c.

DEBT, or *Debt*, is a *Writ* that lies where any *Sum* of *Money* is due to a *Man* by reason of *Account*, *Bargain*, *Contract*, or *Obligation*, or other *Specialty* to be paid at a certain *Day*, which is not paid, then he shall have this *Writ*; but *Action* of *Debt* will not lie for *Money* due to a *Lord* by his *Tenant* for any *Rent-Service*, but he must distrain for it: So for *Rent-charge* or *Rent-sock*, which any *Man* hath for *Life* in *Tail* or in *Fee*, he shall not have any *Action* of *Debt* as long as the *Rent* continues, but his *Executors* may have an *Action* of *Debt* for the *Arreages* due in the *Lives* of their *Testator*.

DETACHMENT, a *Military Term*, signifying a certain *Number* of *Soldiers* taken out of a greater *Body*, on purpose to be employed in the *Undertaking* of some particular *Enterprize*; it is to form a kind of flying *Camp*, to relieve a *Party* already engaged in *Battel*, to join a separate *Army*, to assist at the *Siege* of a *Place*, to enter into some *Garrison*, &c.

DETENTS, in a *Clock*, are those *Stops* which, by being lifted up or let fall down, do lock and unlock the *Clock* in striking.

DETENT-Wheel, or *Hoop-Wheel*, in a *Clock*, is that which has a *Hoop* almost round it, wherein there is a *Vacancy*, at which the *Clock* locks.

DETERGENT: See *Absfergent*.

DETERMINED Problem, in *Geometry*, is that which hath but one, or but one certain *Number* of *Solutions*. This *Problem* hath but one only *Solution*, *viz.* To describe an *Isoceles Triangle* on a given *Line*, whose *Angles* at the *Base* shall be double to that at the *Vertex*: But this following hath two *Solutions*; To find an *Isoceles Triangle*, whose *Area* and *Perimeter* are given.

A determined *Problem* may be either *Simple* or *Linear*, *Plane*, *Solid* or *Surfold*: Which see.

DETERRATION, is a *Removal* of the *Earth*, *Sand*, &c. from the *Mountains* and higher *Grounds*, down into the *Valleys* and lower *Parts*: This is occasioned by *Rain*, which wash the *Earthy Matter* down by degrees; but this cannot be very considerable, or much raise the *Surface* of the *Earth*, as some have imagined, because a good *Part* of it is sunk into the *Clefts* and *Caverns* of the *Rocks* and *Mountains*, a great *Quantity* is born down into *Rivers*, and thence into the *Sea*, and the richer and finer *Part* helps to compose the *Bodies* of *Plants* and *Vegetables*.

DETERSIVE Medicines, are such as are used to cleanse the *Body* from sluggish, viscous and glutinous *Humours*.

DETINUE, is a *Writ* that lieth against him, who having *Goods* or *Chattels* delivered him to keep, refuseth to deliver them again; and he taketh his *Action* of *Detinue* that intendeth to recover the thing delivered

delivered, and not the Damages sustained by the *Detritum*.

DETONATION, is a Chymical Word, expressing the thundring Noise that is often made by a Mixture being enkindled in the containing Vessel; for the volatile Parts do fly out with great Velocity and Impetuosity: 'Tis the same with *Fulmination*.

DETRUSOR-URINÆ, is a Muscle which is by some reckoned the first proper Membrane of the Bladder, lying under that which is derived from the *Peritonæum*; its Carnous Fibres embracing the whole Bladder like a Hand (as *Spigelius* represents it) compresses it in the Evacuation of the Urine.

DEVASTAVERUNT *bona testatoris*, is a Writ lying against Executors for paying Legacies and Debts without Speciality, before the Debts upon the said Specialities be due, to the Prejudice of Creditors.

DEVENERUNT, is a Writ directed to the Escheator, when any of the King's Tenants holding in *Capite* dies, and when his Son and Heir within Age, and in the King's Custody dies, then shall this Writ go forth, commanding the Escheator, that by the Oaths of Twelve good and lawful Men, he enquire what Lands or Tenements, by the Death of the Tenant, come to the King.

DEVISE, or *Divise*, (in Common Law) is when a Man in his Will bequeaths his Lands or Goods to another after his Decease; and he to whom the Lands or Goods are bequeath'd, is called the *Devisee*.

DEVOURING, if any Fishes are born in an Escutcheon in a feeding Posture, the Herald's Term for it is Devouring, because Fish swallow all their Meat whole.

DEUTEROPATHIA, is a Disease that proceeds from another Disease; for Example, as the Head-Ach from the Distemper of another Part, the Morbifick Matter being translated thither from its former Repositories. *Blanchard*.

DEW, is composed of Steams of the Terrestrial Globe, which, for a while, swim to and fro in the Air, but at last convene into Drops, and then fall down again to the Earth.

DEW of *Vitriol*, so some Chymists will call a kind of *Phlegm* which is drawn from Vitriol in *Balneo Mariae*, or with a gentle Heat.

DEXTER Side or Point, is the Right Side or Point in an Escutcheon. *Vid. Escutcheon*.

DIABETES, so *Galen* calls it, and *Agineta Dipsacus*, from the great Thirst that attends it; and as others will have it, from a certain sort of Serpent called *Dipsacus*, found especially in *Libya*, which poysons with its Bite, and brings an unquenchable Thirst upon the Person affected. The Disease is too great a Fusion of the Blood, whereupon the *Serum* passes the Reins, and is voided in great Quantities by the Passages of the Urine. *Blanchard*.

DIABROSIS, is a Solution of the *Continuum* by Corrosion of the Parts. *Blanchard*.

DIACLYSMA, is a washing of the Mouth to cleanse it, or to strengthen the Teeth or Gums. *Blanchard*.

DIACOPRÆGIA, a Medicine of Goat's Dung, and used against Tumours in the Spleen and Glands behind the Ears, called *Parotides*. *Blanchard*.

DIACOUSTICKS, or *Diaphonicks*, is the Consideration of the Properties of refracted Sound, as it passes through different Mediums.

DIACRISIS, is a Distinction and Dijudication of Diseases and Symptoms. *Blanchard*.

DIADOCHÉ, is a succeeding by a *Crisis*. *Blanchard*.

DIADROME, the same with the *Vibration*, or Motion, or Swing of a Pendulum.

DIÆRESIS, in Anatomy, is the eating out, or consuming of the Vessels of an Animal Body, when, from some cutting corroding Cause, some Ways and Passages are made which naturally ought not to have been; or when some which really are, yet are dilated more than ordinary, so that the Humours which ought to have been contained in the Vessels, run out. *Blanchard*.

DIÆRESIS in Grammar, is the Division of one Syllable into two, as in this Verse of *Tibullus*, *Stamina non ulli dissoluenda Deo*, for *Dissoluenda*. This

DIÆRESIS is usually noted by two Points placed over a Letter, to shew that it is founded by it self, and not joined with any other, so as to make a Diphong; as *Æra* by the Points over the *æ*, is distinguished from *Æra*. 'Tis also a kind of *Metaplasim* or Addition to a Word, by dividing one Syllable into two, as *Aulæ*, by a *Diæresis*, is of three Syllables, instead of *Aulæ*.

DIÆTETICA, is a Part of Physick that prescribes the Use and Knowledge of the *six non-natural Things*, as the Physicians speak.

DIAGONAL, in Geometry, is a Line drawn across from Angle to Angle in any Figure, and is by

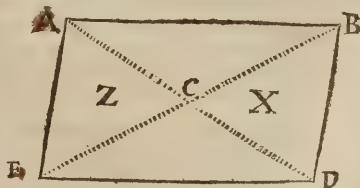


some called the *Diameter*; as in this Figure, *ab* is called a *Diagonal*.

Propositions.

1. Every *Diagonal* divides a Parallelogram into 2 equal Parts; for the 2 Δ 's, acb and abd have the Sides $cb = ad$, $ac = db$ (because opposite ones of the Figure;) and the Angle $cab =$ to the alternate one adb , wherefore they are equal to each other. *Q. E. D.*

2. Two *Diagonals* AD and BE being drawn in any Parallelogram, do bisect each other: I say $AC = CD$, and $BC = CE$; for in the Triangles Z and X , the Vertical Angles at C are equal, and



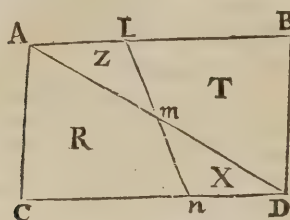
the alternate ones EAD and ADB are also equal, and the Side $AE = BD$; therefore all the Sides of Z are equal to those of X , and consequently $AC = CD$, and $EC = CB$. *Q. E. D.*

3. A Line (as LN) passing thro' the middle Point (m) of the *Diagonal* of a Parallelogram (AD) divides the Figure into two equal Parts: I say $Z + R = T + X$; for $Z + T = R + X$ (because of the

G g

Dia-

Diagonal) and the Triangle $Z =$ Triangle X , as having the vertical Angles at M , and the alternate ones DAB and ADC , and also the Side AM and MD , all respectively equal to each other; therefore the remaining Trapezium R , when the



Triangle Z is taken away, must be equal to T when X is taken away; but if R be equal to T , and $Z = X$, then $Z + R$ must be equal to $X + T$, and each will be equal to half the Parallelogram.

Q. E. D.

DIAGONAL Scale: See *Scale*.

DIAGNOSTICKS, a Term in Medicine, are the present Signs whereby to judge of a Disease, or a Knowledge whereby Men understand the present Condition of a Distemper; and they make it threefold, either a right Judgment of the Part affected, of the Disease it self, or of its Cause.

DIAGRAM, is a Scheme for the Designation or Demonstration of any Figure.

DIAGRYDIUM, or *Diagrydium*, Scamony prepared by boiling it in a hollowed Quince; some prepare it with Juice of Quince, and others with Juice of Lemons, or of pale Roses.

DIAL, the first *Sun-Dial* that was set up in *Rome*, was by *Papirius Cursor*, about the Year of the City 447, (and before that there is no mention, saith *Pliny*, of any Account of Time but of the Sun setting and rising:) This Dial was set up in the Temple of *Quirinus*, but it went not right. About 30 Years after this, *M. Valerius Messala* (says *Varro*) being Consul, brought out of *Sicily*, from the taking of *Catana*, another *Dial*, which he set up on a Pillar near the *Rosstrum*; but for want of its being made for that particular Latitude, it could not go true. Nevertheless they made use of it 11 Years, and then *Martius Philippus*, who was Censor with *L. Paulus*, set up another that was more exact. The Greeks also were a long Time without Clocks and *Sun-Dials*. Some attribute the Invention of *Sun-Dials* to *Anaximenes Milesius*, and some to *Thales*. There are many Kinds of *Dials* mentioned by *Vitruvius*, as, one invented by *Berosus* the *Chaldean*, which was on a reclining Plane, parallel almost to the Equinoctial; on this was an half Circle; and thence 'twas called *Hemicyclus*.

Aristarchus Samius found out the *Hemisphere Dial*, and there were some Spherical ones, with a Needle for a *Gnomon*. The *Discus* of *Aristarchus* was an *Horizontal Dial*, with its Limb raised up all round to prevent the Shadow from extending it self too far off.

DIAL-PLAINS, are plain Superficies upon which the Hour-Lines are drawn in any Latitude, and may be distinguished into *Parallel*, *Perpendicular* and *Oblique*, according to their Position with respect to the *Horizon* of the Place where they are made.

Parallel Plains or *Dials* are such as lie level with the *Horizon*, and on that account termed *Horizontal Dials*.

Perpendicular Plains are such as stand erect to the *Horizon*, and such are all those that are set against an upright Wall or Building; which are of two Sorts, viz. either *Direct* or *Declining*; and these are often called *Mural Dials*.

Erect, Direct South, West, North, East Plains, are those Walls or Plains which face any one of the four Cardinal Points of the *Horizon*, and the *Dials* made upon such a *Plain* are called *Erect, Direct South, West, North, East Dials*.

Erect { South, } Plains declining East or West,
{ North, }
are those *Plains* which lie open to any Two of the Cardinal Points, as to the *{ South, }* and *East,*

or to the *{ South, }* and *West.*
{ North, }

Oblique Plains, reclining from the *Zenith*, or inclining to the *Horizon*, are also of two sorts, viz. either *direct Reclining*, or *Declining* and *Reclining*.

Direct South, West, North or East Recliners, are those reclining *Plains* which lie open to any one of the Cardinal Points of the *Horizon*.

Reclining { South, } Plains declining East or
{ North, } *West*, are those *Plains* which face any Two of the Cardinal Points *{ South, }* and *East*, or to the *South,* and *West.*
{ North, }

DIALECT, is the peculiar Manner of *Idiom*, Spelling and Pronunciation of any Language in particular Places of the Nation: Thus among the *Greeks*, the *Ionick* and *Dorick* Way of Speaking and Writing was different from the *Athenian*, which therefore are called the *Dialects* of the *Greek* Language; and so it is in all Countries.

DIALECTICAL Arguments, in *Logick*, are such as are barely probable, but do not convince or determine the Mind to either Side of the Question; though some will have *Dialecticks* to be the same as the *Art* of true Reasoning in general, and to be as comprehensive as universal *Logick*.

DIALEMMMA, the same with *Apyrexia*.

DIALLING-GLOBE, is an Instrument made of *Brass* or *Wood*, with a Plane fitted to the *Horizon*; and an Index particularly contrived to draw all Sorts of *Dials*, and to give a clear Demonstration of that *Art*.

DIALLING-SPHERE, is an Instrument made of *Brass*, with several Semi-circles sliding over one another on a moving *Horizon*, to demonstrate the Nature of the Doctrine of Spherical Triangles, and to give the true *Idea* of drawing *Dials* on all Manner of Planes: See more in *Dial*.

DIAMETER, is a Line that passes through the Middle of any Figure from one Corner to another; and this should rather be called the *Diagonal*.

DIAMETER of a Circle, is a Right Line which passes through the Center of a Circle, and is terminated at each End by the Circumference dividing the Circle into two equal Parts.

DIAMETER of a Conic Section, is a Right Line drawn through the Middle of the Figure, and bisecting all the *Ordinates*; and if it bisect them at Right Angles, 'tis called the *Axis* of the Section, and often the *Ax*.

DIAMETER Conjugate, in the *Ellipsis*, is the shortest *Axis* or *Diameter*.

DIAMETER *Conjugate*, in the *Hyperbola*, is a Line drawn parallel to the *Ordinates*, and through the Center or middle Point of the *Transverse Axis*, and is always a middle Proportional between the *Latus Rectum*, and the *Latus Transversum*.

DIAMETRICALLY Opposite, is when two things are opposed to one another right across, or directly contrary, as one End of a *Diameter* is to another.

DIANA'S Tree; dissolve an Ounce of *Silver* in 3 Ounces of Spirit of Nitre, then pour the Dissolution into a Matrafs, in which before you had put 18 or 20 Ounces of Water, and two Ounces of *Quick-silver*: The Glass must be filled up to the Neck; and all must lie still on a round of Straw in some cool Place for 40 Days together, during which time the Tree will begin to spread forth its Branches, and will have little Balls at the End which will represent Fruit.

Another like a Fir Tree may be thus made; dissolve an Ounce of Coppel *Silver* in 3 Ounces of *Aqua fortis*; set the Glass in Sand, and evaporate about half the Moisture, after which add to the Remainder 3 Ounces of good distilled Vinegar; let it be a little hot, and keep it stirring; then put the Matrafs into a little cool Place for about a Month, and then the Tree will rise up to the very Top of the Liquor.

To recover the *Silver* again in both these Experiments: In the *Former* take the whole Matter and shake it together, and then boil it for about $\frac{1}{2}$ an Hour in an Earthen Vessel; then let it cool till it's just no more than luke-warm, and pour upon it gently a Quart of Water, in which you had before dissolved 2 Ounces of Salt; a white Precipitate will fall down, which gather and dry. Put it into a Retort in a Sand Furnace, fitting to it a Receiver filled with Water, and beginning with a small Fire at first, increase it till the Retort is red hot. The *Quick-silver* will distil drop by drop into the Receiver; continue the Fire till no more will come; you will find the Mercury in the Bottom of the Receiver, which wash and dry with a Linnen Cloth and Crumbs of Bread. The *Silver* will remain in the Retort, which may be recovered into pure *Silver*, by melting the Matter in a Crucible with a little *Salt Petre*.

In the latter Experiment, to get the *Silver* again, you need only pour salt Water upon the whole shaken together, which will precipitate a white Powder, and that Powder melted in a Crucible with a little *Borax* or *Salt-Petre*, will run into fine *Silver*. Because this way of making *Diana's Tree* is very tedious, Mr. *Homburg* hath given us, in the *Memoirs Mathem. et de Physique*, A.D. 1692. P. 146. the following Method of making this curious Experiment in less than a Quarter of an Hour's Time.

Take four Drams of Filings of fine *Silver*, with which make an *Amalgam*, without heat, with two Drams of *Quick-silver*; then dissolve this *Amalgam* in 4 Ounces of *Aqua fortis*: Pour this Solution into 12 Paris Points of common Water (which is about 3 Gallons *English*); stir it about a while to mingle it well stopp'd, and then keep it in a Glass Vessel

When you would make the Experiment, take about an Ounce of it and put it in a small Viol, wherein put also about the Quantity of a small Pease of the ordinary *Amalgama* of Gold or Silver, which should be as soft as Butter, and set the Viol at rest for about two or three Minutes; presently after which you will see several small Threads or Filaments arising perpendicularly from the little Bulb of the

newly put in *Amalgama*, and which will sensibly grow, and thrust out on the Sides small Branches in the Form of a Tree. The Bulb or Ball of the *Amalgama* will grow hard, and be like a Pellet of white Earth, but the little Tree will be of the Colour of bright *Silver*.

Only observe, That the Water which serves once for this Experiment, will not serve a second time.

Mr. *Homburg* saith, you may vary the Form of this Metalline Tree almost as you please: The stronger you make the first described Water, the thicker will the little Tree be in Branches, and the sooner formed; but if that be weak, the Branches will be sparing, slender, and slow in growing: And afterwards he shews how several other kinds of Trees may be formed also by *Chrysalization* and by *Digestion*.

DIAPASMA, according to *Pliny*, is a dry Medicine made up of dry Powders, to be sprinkled upon something, as either upon Cloaths to perfume them, or upon Ulcers or Wounds several ways, or upon Drink to make it more delicious. *Blanchard*.

DIAPASON, a Greek Word, signifying a Chord including all Tones; 'tis the same with what we call an *Eighth* or an *Octave*, because there are but seven Tones or Notes, and then the *Eighth* is the same again with the first. *Aristotle* says, it was not called *Diocta*, as it should have been, because the ancient Harp, which had all the Tones then known, had but 7 Strings, the Terms whereof are as 2 to 1.

DIAPHEDESIS, is an Eruption of the Blood by reason of the Thinness of the Vessels. *Blanchard*.

DIAPENTE, an Interval of *Musick*, whose Terms are as 3 to 2, it being the second of the *Concords*, and makes an *Octave* with the *Diateffaron*; it is otherwise called a *perfect Fifth*.

DIAPER, in Heraldry, signifies a Bordure fretted all over with some such things as Bordures used to be charged with, all appearing between the Frets; a bearing which hath been used in some *French* and *Belgick* Coats of Arms.



DIAPHANEITY, is the Property of such a Body as is *Diaphanous*, which is one that is transparent like Glass, the Humours of the Eyes, the *Tunica Cornea*, &c. And such a Body hath its Pores so ranged and disposed, that the Beams of Light can pass freely through them every way.

DIAPHORESIS, Sweating, is a Perspiration of all manner of *Effluvia* through the invisible Pores of the Body.

DIAPHORETICKS: See *Sudorifics*.

DIAPHRAGMATICK-ARTERY, is by some said to issue from the Trunk of the *Aorta*, and thence to go to the *Diaphragma*.

DIAPHRAGM, by some called *Septum Transversum* and *Disseptum*: The *Midriff*, is a Muscle composed of two others, which divide the Middle from the Lower Cavity; the First and Superior Muscle arises from the *Sternum*, and the Ends of the last Ribs on each side. Its Fibres from this Semi-circular Origination, tend towards their Center, and terminate in a *Tendon* or *Aponeurosis*, which hath always been taken for the Nervous Part of the *Diaphragm*. The Second and Inferior Muscle comes from the *Vertebra* of the Loins by two Productions, of which that on the Right Hand comes from the First, Second and Third *Vertebra*. That on the Left Side is something shorter, and both these Productions

tions join and make the Lower Part of the *Midriff*, which joins its Tendon with the Tendon of the *O-ther*, so as that they make but one Membrane, or rather Partition.

The *Diaphragm* is covered with a Membrane from the *Pleura* on its Upper side, and by the *Peritonæum* on its Lower; it is pierced in the Middle to make a Passage for the *Vena Cava*, and in its Lower part, for the *Oesophagus*, and for the Nerves which go to the Upper Orifice of the Stomach. And again, between the Production of the Inferior Muscle, passes the *Aorta*, the *Ductus Thoracicus*, and the *Vena Azygos*.

The *Diaphragm* receives Veins and Arteries called *Phrenica* from the *Cava* and *Aorta*, and sometimes on its Lower Part two Branches from the *Vena Ali-posa*, and two Arteries from the *Lumbares*. It hath two Nerves which come from the third *Vertebra* of the Neck, which pass through the Cavity of the *Thorax*, and are dispersed in the Muscles of the *Diaphragm*.

In its Natural Situation the *Diaphragm* is Convex on the Upper side towards the Breast, and Concave on its Lower one towards the Belly: Therefore when its Fibres Swell and Contract, it must become plain on each side, and consequently the Cavity of the Breast is enlarged to give Liberty to the Lungs to receive the Air in Inspiration; and at the same time the Stomach and Guts are prest for the Distribution of the Chyle. But it diminishes the Cavity of the Breast when it resumes its Natural Situation, and presses the Lungs for the Expulsion of the Air in Expiration.

DIAPHRATONTES, are the Membranes called the *Pleura*, which cover the Inside of the *Thorax*, and leave a kind of Partition in the Middle, called *Mediaſtinum*. *Blanchard*.

DIAPHTHORA, is a Corruption of any Part of the Body.

DIAPLASIS, is the Setting of a Limb which was out of Joint.

DIAPLASMA, is an Ointment, or Fomentation.

DIAPNOE, the same with *Diaphoresis*.

DIAPYEMA, the same with *Empyema*.

DIAPYETICA, are Medicines which ripen and concoct Puerile Matter.

DIARIA Febris, the same with *Ephemera*.

DIARRHOEA, is a Looseness in the Belly which ejects several Bilious, Pituitous, and other Feculent Excrements.

DIARTHROSIS, is a good Constitution of the Bones, whereby they are apt to move easily and strongly; such as is in the Arm, Hand, Thigh, Foot, &c.

DIASTOLE, is the Dilatation or Expansion of the Heart, when the Blood flows into it, from the place where it is as it were accended, the Lungs.

DIASTOLE is also an *Accent* in Grammar, which shews that those Words or Sentences to which it is adjoined, are to be separated, and is marked thus (,) 'Tis also the making long a Syllable which is naturally short.

DIASTYLE, is a sort of Edifice, where the Pillars stand at such a distance one from another, that three Diameters of their Thickness are allow'd for *Intercolumniation*.

DIATESSARON, a Word used in Musick, signifying an Interval composed of one greater Tone, one lesser, and one greater *Semi-Tone*; its Proportion being as 4 to 3. In Musical Composition 'tis called a *Perfect Fourth*.

DIATHESIS, is the Natural or Præternatural

Disposition of the Body, whereby we are inclined to perform all Natural Actions ill or well. *Blanchard*.

DIATONICK, a Term which signifies the Ordinary sort of Musick which proceeds by different Tones, either in ascending or descending; it contains only the two greater and lesser Tones, and the greater *Semi-Tone*.

DICHOPHYIA, is a Fault in the Hair, when it parts and disjoins too much. *Blanchard*.

DICHORÆUS, is the Foot of a Latin Verse consisting of four Syllables, of which the first is long, the next short, the Third long, and the Last short. 'Tis compounded of two *Choræus*, as *Comprobare*.

DICROTUS, is a Pulse that beats twice.

DIDYMI, are Twins.

DIEM clausit extremum, is a Writ that lieth for the Heir of him that holdeth Land of the King, either by Knight-Service or Soccage, and dieth, be he under or at full Age, directed to the Escheator of the County, to enquire of what Estate the Party died seized, and who is next Heir to him, and of what Value the Land is.

DIES CRITICI: See *Critici Dies*.

DIES-DATUS, a Term in Law, signifying a Respite given to the Tenant or Defendant by the Court.

DIESIS, in Musick, is the Division of a Tone below a *Semi-tone*, or an Interval composed of a lesser or imperfect *Semi-tone*; so that when *Semi-tones* are placed where there ought to be Tones, or when a Tone is set where there should be only a *Semi-tone*, this is called *Diesis*.

Enharmonical Diesis, is the Difference between the Greater and the Lesser *Semi-Tone*.

These *Dieses* are the least sensible Divisions of a Tone, and are mark'd on the Score in Form of *St. Andrew's Cross*.

DIEU SON ACT, are Words used in our Law, and it is a Maxim, That the Act of God shall pre-judice no Man; and therefore if a House be beaten down by Tempest, or other Act of God, the Lessee for Life or Years shall not only be quit in an Action of Waste brought against him, but hath by the Law a special Interest to take Timber to build the House again, if he will, for his Habitation. So when the Condition of an Obligation consists in two Parts, in the Disjunctive, and both are possible at the Time of the Obligation made, and afterwards one of them becomes impossible by the Act of God, the Obligor is not bound to perform the other part, for the Condition shall be taken beneficially for him.

DIFFERENCE, in Logick, signifies an Essential Attribute belonging to any Species that is not found in the Genus, and is the *Universal Idea* of that Species; thus Body and Spirit are two Species of Substance, which do contain in their Ideas something more than is in that of Substance; in Body we first find Impenetrability and Extension; in a Spirit a Power of Thinking and Reasoning; so that the Difference of Body is impenetrable Extension, and the Difference of a Spirit is Cogitation.

DIFFERENCE, in Mathematicks, is the Remainder when one Number or Quantity is subtracted from another.

DIFFERENCE of Ascension: See *Ascensional Difference*.

DIFFERENCE of Longitudes, of two places on the Earth, is an Arch of the Equator, comprehended between the *Meridians* of those two places.

DIFFERENCES in a Coat of Arms; So the Herald calls such things as distinguish one Family from another, or Persons of the same Family from each other. They are by *Guillim* accounted either *Anticent*,

ciant or *Modern*: The *Ancient* ones are the *Bordures* of all Kinds; the *Modern* are the *File* or *Labe*, *Crescent*, *Mullet*, *Marlet*, &c.

DIFFORM, is a Word used in Opposition to *Uniform*, and signifies that there is no manner of Regularity in the Form or Appearance of a thing. The *Botanists* use it as a Distinction of the Flowers of Plants. See *Flower*.

DIFFUSION, is usually taken to signify the dispersing of the subtle *Effluvia* of Bodies into a kind of Atmosphere all around them; thus the Light diffused by the Rays of the Sun, issuing all round from that amazing Body of Fire, and thus are the Magnetical Particles diffused every where round about our Earth in Parts adjacent to it.

DIGASTRICUS or *Biventer*, is a double Bellied Muscle (whence its Name) which arises from the Process called *Mammiformis* or *Mastoides*, whence descending it becomes Tendinous, passing through the *Stylohyoideus*, and an Annular Ligament fastned to the *Os Hyoides*; from which Bone some Tendinous Fibres do arise, and join with its second fleshy Belly, ascending from thence to its Insertion at the Middle of the Inferior Part of the Lower Jaw. The Middle Tendon of this Muscle, and its Partner, passing through Two Annular Ligaments, fix'd to the *Os Hyoides*, as Ropes through a double Pulley, is a wonderful Contrivance of the Author of Nature to render them capable of pulling the Lower Jaw down, which had their Progress been direct from their Originations, that could not have been performed. Nor are there any Processes, whether of the *Vertebrae* of the Neck, or the neighbouring Parts, that could give an Origination to those Muscles below their Insertion, as in some *Quadrupeds*; wherefore the Divine Architect of Human Bodies has placed this double Pulley below their Terminations, whereby they perform their designed Office. Hence *Deglutition* is hindered when these Muscles are in Action, they then preventing the Ascent of the Tongue and *Larynx*; neither can we at that Time draw the lower Jaw down, because the *Center of Direction* is pulled upwards; wherefore we are obliged on that Occasion to keep the Jaws close together. But in Dogs and other Voracious Animals, who have these Muscles arising from the Transverse Processes of the first *Vertebra* of the Neck, these Actions are not dependent; whence it is they devour their Aliment so quick.

DIGEST or *Pandects*; the 1st Volume or Tome of the Civil Law is called *Digest*, or *Pandects*: *Digests*, because the Author hath put, or digested all things, every Book and Title in its proper and natural Place and Order; and *Pandects* from *πᾶν* and *ἄρξιν*, as containing and comprehending in it self all that ever *Justinian* drew or collected out of 150000 Verses of the old Books of the Law.

This *Digest* was collected from the Works of 27 Venerable and Eminent Old Lawyers, whereof several were before Christ, and the Others flourish'd in the Time of the Emperors, even unto the Time of *Maximinus*, as we find from *Spartianus* and *Lampridius* in that Emperor's Life. The Tome of the *Digests* is divided into 7 Parts, and they again into 50 Books. To this Tome Sir *Thomas Ridley* adds the *Institutions* or *Institutes*; which see under that Word.

DIGESTER, a Vessel so called by its Inventor Mr. *Papin*, and is a kind of *Balneum Maria Clausum*.

DIGESTIO Chymica, a Chymical Digestion, is when things are digested by an Artificial Heat, just as they are naturally in the Stomach, which is when some Matter is put over a gentle Heat, to infuse it

in some proper *Menstruum* or Liquor fit to dissolve it, that for it may, as near as can be, be like the Effect of a Natural Heat.

DIGESTION, the Concoction of the Aliments, or the Dissolution of them, by which they are turned into Chyle.

Mr. *Charles Leigh*, then of *Brazen-Nose College* in *Oxon*, has a Discourse concerning *Digestion*, published in *Phil. Trans.* N. 162. wherein he supposes that there is necessary to Digestion in the Stomachs of Animals, 1. A Liquid *Menstruum*, which by its peculiar Faculty operates upon their Meat, and helps to dissolve it. 2. A gentle Heat in the Stomach, which he thinks it receives from the Liver, and therein falls in with the Opinion of Dr. *Glaucion*. 3. 'Tis necessary that the Stomach have a Natural Situation. 4. That the *Omentum* be assisting; for it hath been found by Anatomy, that where the *Omentum* hath been purified in an Human Body, it was always accompanied with a bad Digestion and loss of Appetite; and 'tis also observable, that those Creatures which have no *Omentum*, as Hares and Conies, &c. do help their Concoction by doubling their hinder Legs, and resting their Bellies upon them. 4. 'Tis necessary that the Stomach should have a *Tunica Villosa*, which both helps to divide the Meat into small Parcels, and also keeps the *Tunica Carnosa* from being too much distended, which would by degrees weaken and injure its Tone. 5. 'Tis necessary that the Guts should lie in a winding Position, and be of a good length; for otherwise the Meat digested in the Stomach would pass away too fast.

The first of these, the *Liquid Menstruum* or *Natural Ferment* of the Stomach, he thinks consists of these Ingredients; 1. The *Saliva* or Spittle. 2. The Juice contained in the Stomachical Glands. And 3. The Nitro-aerial Spirit of the Nerves.

DIGESTIVE Medicines, are either *Internal* or *External*.

The *Internal* are usually prescribed to prepare the Body by Purgation, which they do by making the Humours fluid, attenuating and drawing viscous or tough Substances, tempering such as are sharp, diluting Salts, blunting, concentrating, and imbibing Acids, &c.

External Digestives, are such as ripen a Tumor, or generate good and laudable Matter in a Wound.

DIGIT, in Astronomy, is the Twelfth Part of the Diameter of the Sun or Moon; 'tis used to express the Quantity of an Eclipse.

DIGITATUM Folium, among the Botanists is the Term for the Leaf of the Plant, which either is composed of many simple Leaves set together upon one Foot-stalk, as in Cinque-foil, Vetches, &c. or else when there are many deep Gashes or Cuts in the Leaf, as in those of Straw-Berries, Hops, &c.

DIGITORUM Tensor: See *Extensor Digitorum Communis*.

DIGITS, or *Monadcs*, a Term in Arithmetick, signifying any *Integer* under Ten, as, 1, 2, 3, 4, 5, 6, 7, 8, 9.

DIJAMBUS, is the Foot of a Latin Verse of four Syllables, and compounded of two *iambicks*, so that the first and last are short, and the two middle long, as *Severitas*.

DILATATION, among the Anatomists, is when any Passages or Receptacles in the Body are too much stretched or distended; and in general, it signifies a thing's taking up more Space than it did before.

DILATORIUM, is a Chirurgeon's Instrument wherewith the Mouth is dilated or opened: It is called

called likewise *Speculum Oris*, because by it one may see into the Mouth.

DILATORES Alarum Nasi, are small thin Muscles, having a double Order of Fibres decussating each other, not unlike the *Musculi Intercostales*; they pull up the *Ala*, and dilate the Nostrils.

DILEMMA, is an Argument compounded usually of four or more Propositions, and so disposed, that own or grant which you will of them, yet still the Argument shall press you, and hem you in, with Difficulties not readily to be solved or surmounted, especially if the *Dilemma* be just; in order to which, the *Division* and *Enumeration* of the *Parts* must be adequate and entire; your *Antagonist* must be truly pressed and affected with one or more of the Propositions; and the *Arguer* himself free from a Possibility of having the *Dilemma* returned upon him.

DILUTE, is a Word frequently used by the Writers of Chymistry and Pharmacy, and signifies the Dissolution of the Parts of a dry Body in a moist or liquid one; for when the Body is so dissolved, they say 'tis *diluted*.

DIMENSION, in Geometry, is either Length, Breadth or Thickness: Thus, a Line has, they say, one *Dimension*, viz. Length; a Surface two, viz. Length and Breadth; and a Body or Solid hath all three *Dimensions*. 'Tis used also with Regard to the Powers of any Root in an Equation, which are called the *Dimensions* of that Root; as in a Biquadratic Equation, the highest Power hath 4 *Dimensions*, or its Index is 4.

DIMETIENT, the same with *Diameter*.

DIMINISHED Angle, a Term in Fortification.

See *Angle*.

DIMINUTIO: See *Litotes*.

DIMINUTION, in Musick, is nothing else but the diminishing or abating somewhat of the full Value or Quantity of any Note.

DINUS, according to some, is the Name of a Disease called usually the *Vertigo*.

DIOPTER, is the same with the *Index* or *Albidada* of an *Astrolabe*, or the like *Instrument*.

DIOPTRA, is an Instrument used by Chirurgeons, whereby one may see into the *Matrix*; otherwise called *Dilatatorium*, wherewith the Womb is dilated and enlarged in the Extraction of a dead Fetus out of it, or in the inspecting any Ulcers that are in it: 'Tis also called the *Speculum Matricis*.

DIOPTRICKS, is a Part of *Opticks* treating of the different Refractions of the Light passing through different *Mediums*, as the Air, Water, Glasses, &c.

DIORTHOSIS, a Chirurgical Operation, by which crooked or distorted Members are made even, and restored to their Primitive and regular Shape.

DIOTA, the Chymist's Term for a circulating or double Vessel.

DIPLASIASMUS, is a Reduplication of Diseases; also two Muscles of the Arm, which serve to turn it about. *Blanchard*.

DIPLOE, is the lower thin Plate or Shell of the Skull; also a double Vessel usually with Chymists.

DIPLOMA, the same with *Diploe*; sometimes it is taken for a complicated or folded Cloth.

DIPPING Needle, is an *English* Discovery (Dr. Wallis thinks by Mr. Blagrave, or some other Greshamite, *Phil. Transf.* 276.) of a Property in the *Magnetick Needle*; that besides its Polarity or Verticity, which is its Direction towards the North in a Horizontal Position, it hath also a Direction of Altitude above the Horizon; and that it will (if duly poised about an Horizontal Axis) always point to a

determinate Degree of Altitude or Elevation above the Horizon in this or that Place respectively.

DIPSACUS, according to some, is the same with *Diabetes*.

DIPTERON, in Architecture, is a Name which the Ancients attributed to those Temples which were encompassed with a double Row of Pillars, making two Portico's, which they called *Wings*; but we commonly call them *Iles*, from the *French* Word *Ailes* of the same Signification.

DIPTOTES, are such Nouns in Grammar as have but two Cases, as *Suppetia*, *Suppetius*, &c.

DIRECT; in Astronomy, a Planet is said to be *direct*, when by its proper Motion it goes forward in the *Zodiac* according to the Succession of the Signs, or rather when it appears so to do, the Observer's Eye being placed on our Earth.

DIRECT, *Erect*, *East* or *West* *Dials*, are those whose Planes lie directly open to the East or West Points of the Heavens, or parallel to the Meridian of the Place.

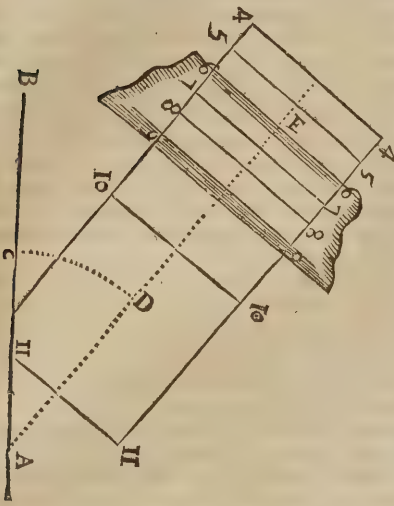
To draw this Dial, the Style's Height may be found according to the Bigness of the Plane, and the Distance of the Hour Lines from each other, by the Direction given under *Polar Dials*, making of them a Table, as in the following one, for the *Lat. 51. Deg. 32. Min.*

Hours.	Angles at Pole.	Tangent.	Hours.
East.	D. M.	Inch. P.	West.
4	30 00	5 77	8
5	15 00	2 68	7
6	Substyle.	60 00	6
7	15 00	2 68	5
8	30 00	5 77	4
9	45 00	10 00	3
10	60 00	17 32	2
11	75 00	37 32	1
12	Infinite.	Infinite.	

Then to describe the Dial, draw the *Horizontal Line* A B; and with 60 *Deg.* from your Chords describe the prick'd Arch C D, whereon set the Co-Latitude of the Place from C to D. From A, through D, draw ADE, representing the Equator of the Dial; then choose a Point in this Line to be the Hour of 6, as at E. Draw 6 e 6 at Right Angles with the Equator; and from E set off the several Tangents as you find them in the Table; and those shall be the several Points for the Hours, and through each Point draw the Hour Lines parallel to the Equator 6 e 6.

The Style may be a straight Pin equal in Height to the Right Line 6, 9. in either Dial, or which is better and more usual, a Rod or Ledge of Iron supported by two Legs, and set upon the Line 6, 6, and of the same Height 6, 9 as the Pin.

A Direct, Erect, East Dial, Lat. 51 Deg. 32 Min.



The West Dial is made after the same manner, only set and numbered a contrary way.

DIRECT, Erect, South or North Dials: See Prime Verticals.

DIRECT, Erect Planes: See Dial Planes.

DIRECT {Inclining
Reclining} Plains: See Dial Planes.

DIRECT South or North {Inclining
Reclining} Dials, are those whose Planes {Incline to the
Recline from the} Horizon
Zenith

and lie directly open to the South or North. These Dials are described after the same manner with Direct South Dials, only observing this Rule in placing the Style.

In South Incliners, the Difference of the Angle of Inclination, and the Height of the Pole, is the Height of the Style above the Plane.

If the Pole's Height be {greater
lesser} than the Angle of Inclination, then the {North
South} Pole is elevated, and the Center is {below.
above.}

In Direct North Incliners, the Sum of the Angles of Inclination and Elevation of the Pole, is the Height of the Style above the Plane.

Note, That Reclining Dials are to be made after the same Manner; for South Incliners are North Recliners, and North Recliners the same with South Incliners, the one being the Back-side of the other.

DIRECT Ray, in Opticks, is the Ray which is carried from a Point of the visible Object directly to the Eye through one and the same Medium.

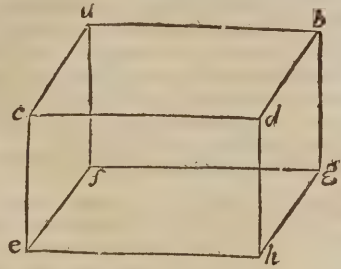
DIRECT Sphere: See Right Sphere.

DIRECTION, a Term in Mechanicks, wherein, by the Line of Direction, they always mean the Line of Motion that any Body observes, according to the Force impressed upon it, and which is determined or directed to move such a way.

DIRECTRIX of the Conchoid: See Conchoid.

DIRIGENT, a Term in Geometry, expressing the Line of Motion, along which the Describent Line or Surface is carried in the Genesis of any Plane or solid Figure.

Thus, If the Line *ab* move along the Line *ac*, so that the Point *a* do always keep in the Line *ac*, a Parallelogram, as *abed*, will be form'd, of which the Side *ab* is the Describent, and the Line *ac* the Dirigent: So also if the Surface *abed* be suppo-



sed to be carried along the Line *ce*, in a Position always parallel to it self in its first Situation, the Solid *adfh* will be formed where the Surface *ad* is the Describent, and the Line *ce* is the Dirigent.

DISABILITY, in Law, is taken notice of four several ways; viz, by the Act of the Ancestor; by the Act of the Party; by the Act of Law; and by the Act of God.

1. Disability by the Act of the Ancestor, is if a Man be attainted of Treason or Felony; by this Attainder his Blood is corrupted, and thereby himself and his Children are disabled to inherit.

2. Disability by the Act of the Party himself, as if one Man make a Feoffment to another that then is Sole, upon Condition that he shall enfeof a Third before *M.* and when such Feoffment is made, the Feoffee takes a Wife; he hath by that disabled himself to perform the Condition according to the Trust in him reposed, and therefore the Feoffer may enter and out him. Also if a Man be excommunicated, he cannot, during that Time, sue, any Action, but shall be thereby disabled; and so in other Cases.

3. Disability, in Act of Law, is properly when a Man, by the sole Act of Law, is disabled, and so is an Alien born; and therefore if a Man born out of the King's Ligeance will sue an Action, the Tenant or Defendant may say that he was born in such a Country out of the King's Ligeance, and demand Judgment if he shall be answered; for the Law is our Birthright, to which an Alien is a Stranger, and therefore disabled to take any Benefit thereby.

4. Disability by the Act of God, as to be *Non compos mentis*, or *Non sana memoria*, which so disables him, that in all Cases where he gives or passes any thing, or Estate out of him, after his Death it may be disannulled and avoided.

DISCENT, in common Law, signifies an Order or Means whereby Lands or Tenements are derived unto any Man from his Ancestors, as to make his Descent from his Ancestors, and is to shew how and by what Degrees the Lands in Question came to him from his Ancestors. And this Descent is either Lineal or Collateral; Lineal Descent is convey'd downwards in a right Line from the Grandfather to the Father, and from the Father, to the Son, and from the Son to the Nephew, &c. Collateral Descent is springing out of the Side of the whole Blood, as Grandfather, Father's Brother, &c.

DISCENS five Disciformis Cometa, (according to some) is a Comet resembling the Shape of a round Dish or Platter; and the Chief of this kind is called a Solar Comet, from the likeness of its Rays to those

of the *Sun*; and otherwise *Rosa* and *Glyseus*, from its bright Silver Colour mix'd with a Golden or Amber Colour: Those of this sort, which are not absolutely circular, but resemble the Figure of a Shield, are thence termed *Clypeiformes*.

DISCLAIMER, in Law, is a Plea containing an exprefs Denial or Refusal; as if the Tenant sue a Replevin upon a Distress taken by the Lord, and the Lord avow the taking of the Distress, saying, That he holdeth of him as of his Lord, and that he distained for Rent not paid, or Service not performed; then the Tenant denying himself to hold of such Lord, is said to *disclaim*, and the Lord proving the Tenant to hold of him, he loses his Land.

DISCONTINUAL Proportion: See *Discrete Proportion*.

DISCORDS, in Musick, are certain Intervals of Sounds, which being heard at the same time offend the Ear; nevertheless when orderly taken and intermix'd with Conords, they make the best Musick. These *Discords* are the Second, Fourth and Seventh, with their Octaves; that is to say, all Intervals, except those few which precisely terminate the *Concords*, are *Discords*.

DISCOURSE, in a Logical Sense, is that rational Action of our Mind by which we form or infer any new Judgment from others before made; or where-by we can infer or conclude one thing from another.

DISCRETE or *Disjunct Proportion*, is when the Ratio between 2 Pairs of Numbers or Quantity is the same, but there is not the same Proportion between all the four Numbers: Thus, if these Numbers 6 : 8 :: 3 : 4, are considered, the Ratio between the first Pair 6 and 8 is the same as that between 3 and 4, and therefore these Numbers are proportional; but 'tis only discreetly or disjunctly, for 6 is not to 8, as 8 to 3; that is, the Proportion is broken off between 8 and 3, and is not continued all along, as it is in these following, which are called *Continual Proportionals*, viz. 3 : 6 :: 12 : 24.

DISCRETE Quantity, is such as is not continued and joined together, as *Number*, whose Parts being distinct Units, cannot be united into one *Continuum*; for in a *Continuum* there are no actual determinate Parts before Division, but they are potentially Infinite; wherefore it is usually and truly said, *That continued Quantity is divisible in Infinitum*.

DISCRETIVE Propositions, are those where various Judgments are made and denoted by the Particles (*but, notwithstanding*) or Words of the like Nature either exprefs'd or understood: Thus, *Fortune may deprive me of my Wealth, but not of my Virtue: They who cross the Sea, change only their Country, but not their Disposition*, are called *Discrete Propositions*.

DISCUS, among the *Romans*, was a round Quoit of Metal or Stone about a Foot in Diameter, which, in ancient Exercises, they threw in the Air to shew their Strength: Also they gave the same Name to a round Shield consecrated to the Memory of some famous Hero, and hung up in the Temples of their Gods as a Trophy for some great Action. From the Figure of either of which, but rather from the former, comes the Word so much in use among Astronomers, viz. the *Disk* of the Sun or Moon; by which they mean the Round of the Planet's Body as it appears to us.

DISCUS, is used by the Botanists to denote the middle, plain and flat Part of some Flowers; such as *Caltha*, *Flos Solis*, &c. because 'tis in Figure like the ancient *Discus*: And they reckon two kinds of Plants with a *Discous Flower*;

1. Such as have the Flower compounded, and the Seed pappous, but the Leaves and Stalks are not Milky when broken.

2. The *Corymbiferous Plants*, whose Flowers are compounded into a Discous Figure, but their Seeds are not Pappous: Of the former kind are the *Fleabanes*, *Ragweeds*, *Groundsels*, &c. and of the latter are *Daisies*, *Chamemile*, *Tansy*, *Wormwood*, &c.

DISCUSSION, hath two Senfes among Writers; sometimes it signifies the clear treating or handling of any particular Point or Problem, so as thereby the Word implies to *shake* off those Difficulties with which it is embarrassed; and thus we say, such a Point was well *discussed*, when it was well treated of and cleared up. But

DISCUSSION is also used in a Medical Sense, for the dispersing the Matter of any Tumor or Swelling in the Body, and therefore the Surgeons define *Discussion* to be an Evacuation of some thin Matter gathered in any Part by insensible Evaporation; and this is procured by the Natural Heat being increased by proper Medicines.

DISDIAPASON, a Term in Musick, denoting a double Eighth or Fifteenth.

DISEMBOGUE, when a Ship passeth out of the Mouth of some Gulph, they call it *Disemboguing*: They say also of a *River*, that at such a place, or after it hath run so many Leagues, it *disembogues* it self into the Sea.

DISJUNCT Proportion, the same with *Discrete*: Which see.

DISJUNCTIVE Propositions, are those wherein the Disjunctive, Conjunctive (*or*) is found; as, *either the Sun moves about the Earth, or the Earth about the Sun; Men are guided either by Interest or Fear*.

DISLOCATION, the same with *Luxation* or putting a Limb or any Bone of the Body out of Joint.

DISMES Decima are Tythes, and signify the Tenth Part of all the Fruits of the Earth, or tame and profitable Beasts of it, or of Mens Labour.

DISMOUNT, in the common Military Use, is to unhorse, as to dismount the Cavalry; but they call it also *dismounting of Cannon*, when they are thrown off the Carriages, and are broken, or any Horse rendered unfit for Service.

DISPART, a Term in Gunnery, signifying the setting a Mark on the Muzzle-Ring of a Piece of Ordnance, or thereabouts, so that a Sight-Line taken upon the Top of the Base Ring against the Touch-hole, by the Mark set on or near the Muzzle, may be parallel to the Axis of the Concave Cylinder. The common Way of doing which, is, to take the two Diameters of the Base Ring, and of the Place where the *Dispart* is to stand, and divide the difference between them into two equal Parts, one of which will be the Length of the *Dispart*, which is set on the Gun with Wax or Pitch, or fastened there with a Piece of *Twine* or *Marlin*: But an Instrument may be made to do it to all possible Nicety.

DISPENSATORY, is a Book used by *Apothecaries*, wherein all Medicines, at least the most usual, are contained and prescribed, that they may be prepared in the Shops all the Year round.

DISPLAYED, the Term in Heraldry for an Eagle in an erect Posture, and her Wings spread abroad.

DISPONDÆUS, is the Foot of a Latin Verb consisting of four Syllables, and those all long, as *Concludentes*, so that this is a Composition of two *Spondees*.

DISPOSITION: See *Method*. In Architecture they call the just placing of all the several Parts of an Edifice, according to their proper Order, *Disposition*.

DISQUISITION, an Enquiry into the Nature, Kinds and Circumstances of any Problem, Question or Topick, in order to gain a right Notion, and to discourse clearly of it.

DISSEISIN, in Law, signifies an unlawful dispossessing a Man of his Land, Tenement, or other immovable or incorporeal Right.

DISSEISIN upon *Disseisin*, is where the *Disseisor* is disseised by another.

DISSEMINATE Vacuum: See *Vacuum*.

DISSIMILAR Leaves, are the two first Leaves of any Plant at its first shooting out of the Ground; and are so called because they usually are of different Form from the common Leaves of the grown Plant. These Dr. Grew observes to be nothing but the very Lobes of the Seed expanded and thus advanced. Their Use is for the Protection of the *Plume*, which being young and tender, is thus guarded on each Side, and also hath some Rain or Dew gradually conveyed down to it by this Means.

DISSIMILAR Parts, in Anatomy, (by some called *Compound* and *Organical*) are such as can be divided into various Parts different from one another; as the Hand is into Veins, Muscles, Bones, &c. whose Portions are neither of the same Nature nor Denomination.

DISSOLVING Medicines: See *Discussion*.

DISSOLUTION, is when Electuaries and Powders are mingled and dissolved in Water or a Decoction. *Blanchard*.

DISSONANCE, in Musick, is a disagreeable Interval between two Sounds, which, being continued together, offend the Ear.

DISTANCE, in Navigation, is the Number of Degrees, or Leagues, &c. that a Ship has sailed from any given Point.

DISTANCE of the Bastions, in Fortification, is the Side of the *Exterior Polygon*.

DISTEMPER, a Term in Painting for the working up of Colours with something else besides bare Water or Oil; for if the Colours are prepared with the former of these, that kind of Painting is called *Limning*; and if with Oil, 'tis called *Painting in Oil*, and simply *Painting*; but if the Colours are mix'd with Sile, Whites of Eggs, or any such proper glutinous or unctuous Substance, and not with Oil, they then say 'tis done in *Distemper*, as the admirable *Cartons* are at *Hampton Court*.

DISTENTION, is when Parts are puffed up, dilated or relaxed by any thing; as the Guts by Wind raised from Effervescences within them, whence Oppressions and Pains frequently proceed. *Blanchard*.

DISTILLATION, is drawing off some of the Principles of a Mixture, as the Oil, Spirit, Water, &c. in proper Vessels, by the help of a Fire; and is twofold.

1. *Per Ascensum*, when the Matter to be distilled above the Fire.

2. *Per Descensum*, when the Matter to be distilled is below the Fire, and so the Vapour not being able (by the Contrivance of the Vessel) to rise upward, is forced to precipitate and to distil down to the Bottom of the Vessel.

Oil of Cloves, if you would have it White, is best made this Way.

Distillation of Vegetables or Minerals is very different, according to the Nature of the Body to be distilled. Acid Spirits are drawn in a strong Re-

tort, and with very great Fires, and usually in a Reverberatory Furnace. Ponderous Woods are distilled in a Retort after the same manner, and with near the same Degree of Heat, such as *Guajacum*, *Box*, &c. and in these first comes a little Phlegm, and then the Fire increasing, the Spirits fly out in white Clouds; when they cease to come, the Matter in the Receiver is filtrated through a Tunnel lined with Cap-Paper; the Spirit will pass, but leave the Black Fetid Oil in the Tunnel, which afterwards may be rectify'd (if it be worth while) by making it up into Pellets with Sand, and then distilling it over again in a naked Fire, there will come over a clear Oil. The Spirit also may be rectify'd by distilling it over again in a Glass Alembick: Put Fire to the black Coals remaining in the Retort, and they will soon kindle and turn to Ashes; which Ashes may be calcined a while in a Potter's Furnace, and then a *Lixivium* being made of them with Water, and the Water filtrated and evaporated, the fix'd Salt of the Wood will remain at the Bottom; and thus all the five Principles may be drawn from *Amber*, *Ponderous Woods*, &c.

Plants that are Odoriferous are to be distilled *per Vescam*, but first let a strong Decoction of the same Plant be poured hot upon the Plant it self bruised and put into the Body, and there let the Matter digest two Days, the Vessel being close stop'd: Then fit all things for Distillation, and with a Fire of the second Degree draw off about half the Water you poured on the Plant; this will be a very good Water, and taste and smell strongly of the Plant.

Press through a Cloth strongly what remains in the Body, filtrate and evaporate in a gentle Heat till the Matter be of the Consistence of thick Honey. This is the *Extract* of the Plant; but the Extracts of Odoriferous Plants are not so good as those of Vegetables which are not so, because abundance of the finer Volatile Parts evaporate with the Moisture.

Dry what remained in the Cloth after Expression, and then burn it (with more of the Plant dried, if you will;) Make a *Lixivium* of the Ashes, and then filtrate and evaporate to driness, and the fix'd Salt of the Plant will remain at the Bottom. And thus may Balm, Wormwood, Sage, Hyssop, &c. be distill'd, and their Waters, Oils and Extracts made, and their fix'd Salts gain'd.

To distil Plants that are not Odoriferous, 'tis best to proceed thus; pound the Plant, and then fill two Thirds of the *Vesica* or *Alembick* with it, and after that pour on a good quantity of the expressed Juice of the same Plant, so that the bruised Matter may float in the Juice, and not stick to the Bottom or Sides of the Vessel: Then fit on the Head, and draw off about half as much Water as you used Juice; this will be a very good distill'd Water of that Plant. Press through a Cloth what remains in the Still, and let the Juice settle; then filtrate it, and after that, in a small Heat, evaporate about two Thirds of the Liquor in a Glass or Earthen Vessel; then remove the Vessel into a Cellar, or some such cool place, and the *Essential Salt* will shoot out into Crystals; which gather, and keep in a Viol well stop'd; or you may make the *Extract fixed Salt* of it as above directed, as of an Odoriferous Plant.

To distill a Spirit from any Plant like that of Scurvy-Grass, they proceed thus: The Plant is pounded to a Pulp in a Marble Mortar, and then put into an Earthen Vessel so as to fill it but half full; after which the expressed Juice of the same Plant is poured

ed upon it till it be about 6 Inches above the Matter: After this they mix with it all about a Pint of *Yess* or *Barn*, and then stopping the Vessel, they set it to ferment, either in the warm Sun, or in Horse Dung, for three or four Days, or more if it be cold Weather: As soon as you perceive that it hath done fermenting, and that its Surface begins to sink or subside, put the Matter speedily into a Cucurbite or *Vesica*, and luting on the Head, set the Vessel in a *Balneu Vaporis*, and distil, with a gentle Fire, about two Pints of the Liquor, which will be very Spirituous; and if you rectify again, and draw off half of it, it will be a very fine Spirit. What remains in the Body may be distill'd farther, and a Water will run off, that is as good or better than any distill'd Water of that Plant drawn the common way.

After this Manner also the *Ardant* or *Inflammable* Spirit of Roses, &c. may be drawn.

DISTINCT Base, in Opticks, is that precise Distance from the Pole of a Convex Glass, in which Objects, beheld through it, appear *distinct* and well defined; so that 'tis the same with what is otherwise called the *Focus*. The *Distinct Base* is caused by the Collection of the Rays proceeding from a single Point in the Object, into a single Point in the Representation; and therefore Concave Glasses, which do not unite, but scatter and dissipate the Rays, can have no real *Distinct Base*.

DISTINCT Vision: See *Vision*.

DISTORTION, is when the Parts of an Animal Body are ill placed or ill figured.

DISTRESS, in Law, signifies a Compulsion in certain real Actions, whereby to bring a Man to appear in Court, or to pay a Debt of Duty denied; the Effect thereof, most commonly, is to drive the Party distrained to replevy the *Distress*, and so to take his Action of Trespass against the Distrainer, or else to compound with him for the Debt or Duty for which the *Distress* was made. There are several things not *distrainable*; for a *Distress* must be of a thing whereof a valuable Property is in some Body, and therefore Dogs, Bucks, Conies, and the like, that be *ferre nature*, cannot be distrained. 2. Although it be of a valuable Property, as a Horse, (yet when a Man or Woman is riding on him) or an Ax (in a Man's Hand cutting of Wood) and the like, are for that time privileged, and cannot be distrained. 3. Valuable things shall not be distrained for Rent, for Benefit and Maintenance on Trades, which, by consequence, are for the Commonwealth, and are by Authority of the Law there; as a Horse in the Smith's Shop; Materials in the Weaver's Shop for making Cloth; Cloth or Garments in the Taylor's Shop, Sacks of Corn or Meal in a Mill, nor in a Market, nor any thing distrained for *Damages-feasant*, for it is in *Custodia Legis*. 4. Nothing shall be distrained for Rent, that cannot be rendered again in as good a Plight as it was at the time of the *Distress* taken; as Sheaves or Shocks of Corn cannot be distrain'd for Rent, but for *Damages-feasant* they may. 5. Beasts belonging to the Plough shall not be distrain'd, but Goods may. 6. Furnaces, Cauldrons, or the like, fix'd to the Freehold, or the Doors or Windows of a House, or the like, cannot be distrained. When a *Distress* that hath Life in it, is taken, it must be brought into the common Pound, or kept in an open Place, where the Owner may give it Food.

Distress is taken to be either *Real* or *Personal*: *Distress Real* is made upon immoveable Goods, as the *Grand-Cape* and *Petit-Cape*, by which the Land it self is seized. *Distress Personal*, is made by taking

a Man's moveable Goods, and detaining them for Security of his Appearance to the Suit. *Distress* is also either *Finite* or *Infinite*; *Finite* is that which is limited by Law, how often it shall be made to bring the Party to Trial of the Action: *Distress Infinite*, is with Limitation until the Party come, as against a Jury that refuseth to appear *Super certificatione Assise*, where the Process is a *Venire facias, habeas corpora*, and *Distress Infinite*, &c.

DISTRIBUTO Chyli, the Chyle is distributed when, after a due Fermentation in the Ventricle and the Guts, it soaks into and through the Glandulous Tunick of the Intestines; and passing through the Laeteal Veins, and its proper Channel along the Side of the Thorax, at last falls into the Subclavian Vein, that it may circulate with the Blood, and receive its Colour. *Blanchard*.

DISTRICHIASIS, is a double Row of Hair on the Eye-lids.

DISTRINGAS, is a Writ directed to the Sheriff or any other Officer, commanding him to distrain one for Debt to the King, &c. or for his Appearance at a Day.

DISSYLLABLE, is a Word consisting only of two Syllables, as *Virtue*.

DITONE, a double Tone, or the greater Third, is an Interval in Musick which comprehends two Tones; the Proportion of the Tones that make the *Ditones*, is as 4 to 5, and that of the *Semi-ditones* as 5 to 6.

DIVERGENCE Point: See *Vertical Focus*.

DIVERGENT, or *Diverging Rays*, in Opticks, are those *Rays* which going from a Point of the visible Object, are dispersed, and continually depart one from another, according as they are removed from the Object.

DIVIDEND, in Arithmetick, is the Number proposed to be divided into certain equal Parts.

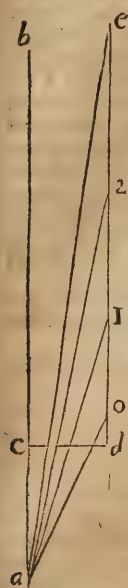
DIVIDUAL, is that part of the *Dividend* distinguished by a Point, in working by the Rule of Division in Arithmetick.

DIVINATORIA Virgula: See *Virgula Divinatoria*.

DIVISIBILITY, is that Disposition of a Body, whereby it is conceived to have Parts, into which it may actually or mentally be divided.

All Quantity is infinitely, or rather indefinitely divisible: for should it be otherwise, it would be divisible into Parts that are not *Quantæ*, which cannot be, for no accidental Change can destroy the essential Properties of a Being: Yet this infinite *Divisibility* can never actually be effected, because when you have divided a Line, or any other Quantity, into any number of Parts, every one of these Parts is further divisible into as many Parts as the whole was, and so on, as is many ways demonstrable in Geometry; wherefore there can be no such thing as a determinate Number of actual Parts in any continued Quantity; which is farther also demonstrable from the Consideration of incommensurable Quantities; as that the *Diagonal of a Square is incommensurable with its Side*, as *Euclid* proves, *Lib. 10. Prop. 117*. And that the Parts in any Line are Infinite or Indefinite, will plainly appear by the following *Diagram*.

Let the Line *ab* be conceived to be drawn parallel to *de* at the perpendicular Distance *cd*, which suppose to be half an Inch: 'Tis plain, the Line *de* being capable of being infinitely produc'd, there may be taken in it as many Points, *o*, *1*, *2*, *e*, as you please: and from *a* to each of them can a Right Line be drawn, as in the Figure, which will divide the Line *cd*, though but of $\frac{1}{2}$ an Inch in Length, into as many Parts as you take in the low-



In *Division* the Number or Quantity to be divided, is called the *Dividend*; that by which you divide, the *Divisor*; and the number of Times that the *Dividend* contains the *Divisor*, is called the *Quotient* or *Quota*, and sometimes the *Parabola*; the Reason of which see under that Word.

○ ○ ca cb
 ca cb

That the same Reason for like Signs giving a positive, and unlike a negative Quotient, must hold in *Division* as well as in *Multiplication*, is clear from considering the Nature of *Division* (which is only resolving the thing into its Parts) therefore, since every Dividend is nothing else but the Product of the Divisor and Quotient multiplied by each other,

Hh 2

the Quotient must consist of such Signs which could produce the Dividend; therefore if the Dividend be divided by a Quantity that hath a similar Sign with it, the Quotient must be positive; if by a Quantity having a dissimilar Sign, it must be Negative.

It may be a General Rule in Compound Division in Algebra, as will, when multiplied into the Divisor, produce the Dividend, for that is always a Rectangle under the Divisor and the Quotient.

An Example of Compound Division in Algebra.

$$zz - 16) z^6 - 8z^4 - 124zz - 64(z^2 + 8zz + 4z^2 - 16z^2)$$

$$8z^4 - 124zz$$

$$8z^4 - 128zz$$

$$4zz - 64$$

$$4zz - 64$$

0

DIVISION in whole Numbers is thus perform'd.

1. To divide by one Figure is very easy, as suppose 6759 were to be divided amongst 3 Men, how much is each Man's Share? Set the Numbers down as you see here; 3) 6759 (2253.

And then say, 3 is contained in 6 (the first Figure towards the Left-hand of the Dividend) twice; wherefore I place 2 in the Quotient; then I go on to the next Figure, and say, 3 is found in 7 twice, and there is one over: I place 2 in the Quotient again; and I imagine the one that was over to stand before the next Figure 5, which will make it 15: Then I enquire how oft I can have the Divisor 3 in 15, and finding it just 5 times, I place 5 in the Quotient. Then I go to the last Figure, and ask how often I can have 3 in 9, which I find to be 3 times I write 3 in the Quotient; and so the Operation is over, 2253 being the true Quotient, or the number of Pounds that each Man must have.

2. When you are to divide a Number by a Divisor that consists of 2, 3, or more Places, the Operation is more tedious and difficult (it being indeed the hardest Lesson in Arithmetick) but yet it may, with a little Practice, be readily perform'd thus; suppose 940488 Crowns were to be divided among a Ship's Company consisting of 263 Men, what is each Man's Share.

1. Set down the Numbers as you see; then first distinguish by a Point a Part of the Dividend, which

$$263) 940488 (3576$$

$$789$$

$$1514$$

$$1315$$

$$1998$$

$$1841$$

$$1578$$

$$1578$$

0

Dividend, which will therefore be 14; but then

considering 6, the Figure of the Divisor, I find I cannot have as I ought, 6 four times in 14; wherefore I conclude I cannot have 263 four times in 940: I try next then what will 3 do; and I find I can have 2 three times, and that there will remain 3, which 3 I imagine to stand before 4, the second Figure of the Dividend, and then it will make it 34; trying therefore with 6, the second Figure of the Divisor, I find I can have that 3 times in 34, and more than enough will remain to be placed before 0, the last Figure of the Dividend; I therefore place 3 in the Quotient just after the crooked Line, and by that Figure which is the

2d Operation, I multiply the Divisor 263, and write the Product 789 orderly under the Dividend 940. Then,

3dly, I subtract the Product 789 from the Dividend, and there remains 151.

4thly, To which I bring down 4, the next Figure to the Right Hand of the Dividend, and which, to shew that I have done with, I mark, by putting a Point under it; so I have now 1514 for a new Dividend. Then do I enquire again, by the Method given in the first Article, how often I can have 263 in 1514, and comparing those Numbers together according to that General Rule, and which a little Practice will make very easy, I find I can have it but 5 times; wherefore I put 5 in the Quotient, and by that multiply my Divisor, and subscribe the Product 1315 orderly under the last Dividend. Then I subtract it also from thence, and find a Remainder of 199; to which Remainder I bring down the next Figure 8 from the Dividend (having also pointed it there) and then I have 1998 for a new Dividend; with which, as before, comparing my Divisor 263, I find that I can have it but 7 times; wherefore placing 7 in the Quotient, by that I multiply the Divisor 263, and subscribing the Product orderly under the Dividend 1998, subtracting it also from thence; and to the Remainder, which is 157, bringing down 8, the last Figure of the Dividend, I have 1578 for a new Dividend; with which, comparing as before, the Divisor 263, I find, on trial, that I can have it just 6 times in it; so I write 6 in the Quotient; by that Figure 6 multiply the Divisor, subscribe the Product 1578 under the Dividend, and making Subtraction, find no Remainder; wherefore I conclude the Division is ended, and that 3576 is the true Quotient, or Number of Crowns each Man is to have for his Share.

And this Example, if carefully heeded, will be sufficient to teach any one the Way of dividing by more Figures than one; the several Operations of which Method are briefly summ'd up in this Latin Verse,

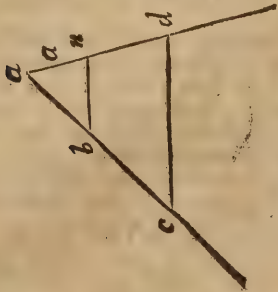
Dic quot, multiplica, subduc, transferq; secundum.

The only true Proof of Division is by Multiplication, for the Product of the Quotient and Divisor must always be equal to the Dividend: Thus, 3576 multiplied by 263, produces 940488, because what is destroyed by Division, is restored by Multiplication.

DIVISION Geometrical, or Division in Lines, is called Application; the Design of which, when it is exercised about the Construction of plain Problems, is only this, viz. a Rectangle being given, as also a Right Line, to find another Right Line, so that the Rectangle contained under it, and the Right Line given, shall be equal to the Rectangle first given; which Effect or Construction is called the Application of a given Rectangle to a Right Line given; and

and the Right Line arising by such Application is called the *Parabola* or *Geometrical Quotient*, and may be found out by the *Rule of Three*, by making, As the Line given: Is to one Side of the Rectangle:: So is the other Side: To the Line sought.

Nor unlike to which is *D. Cartes's* Way of working *Division* in Lines by Scale and Compass: Thus, suppose $ac (=6)$ were to be divided by $ad = 3$, make any Angle at pleasure, and therein set off first $ad (= 3)$ the Divisor, and then on the same Leg $au =$ to Unity: Then, on the other Leg of the An-



gle set $ac (= 6)$ the Dividend, and join dc , and to it, through u , draw $ub \parallel$ to dc , which shall cut off ab the Quotient sought; for, as $ad : au :: ac : ab$; that is, As the Divisor: Is to Unity:: So is the Dividend: To the Quotient; on which depends the Reason of all *Division*.

DIVISION in Decimal Fractions: See *Decimal Fractions*.

DIVISION in Vulgar Fractions: See *Fractions*.

DIVISION of Logarithms: See *Logarithms*, N^o. 7.

DIVISION by Logarithms: See *Logarithms*, N^o. 9.

DIVISION of Proportion: See *Proportion*, N^o. 9.

DIVISOR, in Arithmetick, is the dividing Number, shewing how many Parts the *Dividend* is to be divided into.

DIVORCE, or *Devorce*, is, in the Common Law, a Separation of two Persons actually married together, and therefore is the Solution of the *Vinculum Matrimonii*, and is not only *à Mensa, sed etiam à Thoro*; and therefore a Woman thus divorced, received all again that she brought with her. This is only upon a Nullity of the Marriage, upon some Essential Impediment, as Consanguinity or Affinity within the prohibited Degrees, Pre-contract, Impotency, or such like; of which there are 14 usually sum'm'd up in these Verses by the Divines and Civilians;

*Error, Conditio, Votum, Cognatio, Crimen,
Cultus, Disparitas, Vis, Ordo, Ligamen, Honestas,
Si sis Affinis; si forte coire nequibis;
Si Parochi es duplicis desit presentia Testis,
Raptura si sit nautica, &c.*

DIURESIS, is a Secretion of the Urine by the Reins, which is done after this Manner; There are little Glandules placed near the Emulgent Arteries, wherewith the *Serum* is separated from the Blood, and is conveyed by little Channels (of which the Substance of the Reins does principally consist) to the *Carnucle Papillares*, thence to the *Pelvis*, thence to the *Ureters*, thence to the Bladders, and so out of Doors, *Blanchard*.

DIURETICKS, are those Medicines which by

parting, dissolving, and fusing the Blood, do precipitate the *Serum* by the Reins into the Bladder. *Blan.*

DIURNAL Motion of a Planet, is so many Degrees and Minutes, &c. as any Planet moves in 24 Hours; also the Motion of the *Earth* about its Axis (in the *Copernican System*) is called its *Diurnal Motion*, which causes the Vicissitudes of Days and Nights.

DIURNAL Arch, is the Arch or number of Degrees that the Sun, Moon or Stars describe between their Rising and Setting.

DIUTURNITY, is the long Continuance or Duration of any Being.

DIZZYNESS: See *Vertigo*.

DOCK, is a Pit, great Pond or Creek by the Side of an Harbour, made convenient to work in, in order to build or repair Ships, and is of two sorts.

1. A *Dry Dock*, where the Water is kept out of the *Dock* by great Flood-Gates, till the Ship is built or repaired; but after that, can easily be let in to Float and Launch her.

2. A *Wet Dock*, is any Place in the Ooze out of the Tide's way, where a Ship may be haled in, and do *dock her self*, or sink her self a Place to lie in.

DODECADACTYLUM, is the first of the small Guts, beginning from the *Pylorus* of the Stomach, and ending where the Gut *Jejunum* begins: It is so called as if it were the Length of the twelve Fingers, which yet is never observed in any Men amongst us; perhaps the Ancients mistook, from inspecting the Guts of some Brutes: 'Tis most usually called *Duodenum*. *Blanchard*.

DODECAEDRON: See *Regular Bodies*. This Solid consists of twelve Quinquangular Pyramids, whose Vertexes or Tops meet in the Center of a Sphere that is conceived to circumscribe this Solid, and consequently have their Bases and Altitudes equal; wherefore, having found the Solidity of one of those Pyramids, and multiplied it by the number of Bases, (*viz.* 12.) you have the Solidity of this *Dodecaedron*.

The following Figure being drawn on Pastboard, cut half through, and then folded up, will represent a *Dodecaedron*.



Its Solidity is found by multiplying the Base into 1/2 of its Distance from the Center 12 times. And to find this Distance, take the Distance of two parallel Faces, the Half is the Height.

DODECAGON, a regular Polygon consisting of twelve equal Sides and Angles: In Fortification 'tis a Place with twelve Bastions. **DODE-**

DODECATEMORY: The twelve Signs of the *Zodiack*, *Aries*, *Taurus*, &c. are so called, because each of them is the twelfth Part of the *Zodiack*.

DOGMATICK MEDICINE, is a Rational Practice of Physick; *Hippocrates* was its first Author; and after him *Galen*; therefore those Physicians are called *Dogmatical*, who, upon the Principles, as they pretend, of the School Philosophy, reject all Medicinal Vertues that they think not reducible to manifest Qualities; but *Galen* hath long ago observed very well of such Men, that they must either deny plain Matter of Fact, or assign but very poor Reasons and Causes of many Effects they pretend to explain.

DOME, so the *CHYMISTS* call the arched Cover to their Reverberatory Furnace: See the Figure of it under that Word, or in *Furnace*.

DOME, in Architecture, is a round, vaulted or arched Roof of a Church, or any such great Building.

DOMINICAL LETTER, one of the first seven Letters of the Alphabet, wherewith the Sundays are mark'd throughout the Year in the *Almanack*.

To find the Dominical Letter.

Divide the Year, its 4th, and 4 by 7. what's left subtract from 7, the Letters given. *A* 1, *B* 2, *C* 3, *D* 4, *E* 5, *F* 6, *G* 7.

Example.

In the Year	1701
The 4th Part, omitting Fractions, is	425
To both which add the number	4
The Sum is	2130

Which Sum divided by 7, leaves 2 remaining, and 2 from 7 leaves 5, which shews the Dominical Letter for the Year 1701, is the Fifth in the Order of the Alphabet, that is, *E*.

DOMINICUM, *Demain*, or *Demesne*, are Lands not rented to Tenants, but held in *Demesne*, or in the Lord's own Use and Occupation.

DOMO REPARANDA, is a Writ for one against his Neighbour, by the Fall of whose House he feareth Hurt to his own.

DONJON, in Fortification, is generally taken for a large Tower or Redoubt of a Fortrefs, where the Garrison may Retreat in case of Necessity, and Capitulate with greater Advantage.

DORICK Order of Architecture, was invented by the *Dorians* a People of *Greece*, whence the Name. If its Columns are Simple and Plain without *Pilasters*, *Palladio* saith they ought to be 7 Modules and one Half, or 8 Modules high. The Intercolumniations are to be little less than 3 Diameters of the Column: And this Manner of Building is by *Vitruvius* called *Diastyle*.

But if the Columns have *Pilasters*, their Height, reckoning Base and Chapter, must be 17 Modules and $\frac{1}{2}$; and by the by, though the Module in all the other Pillars be a Diameter divided into 60 equal Parts, yet in this Order the *Module* is to be accounted but as the Semi-diameter, and is therefore of 30 such Parts, according to *Palladio*.

This Pillar hath no proper Base, which is the Reason that mostly in the Ancient Buildings you see them without any Base at all, as in *Marcellus* his Temple at *Rome*, &c.

But when the Attick Base is given it, it much

augments its Beauty, and then the Height of the Base is to be $\frac{1}{4}$ the Diameter of the Column.

The Capital's Height also ought to be half the Diameter of the Pillar at the Base, and the Architecture the same Height. The *Freeze* is a *Module* and $\frac{1}{2}$ Height, and the *Cornice* is a *Module* and $\frac{1}{2}$. The *Triglyph* is one *Module*, and its Capital the 6th Part of one; the *Metops* or Space between *Triglyph* and *Triglyph*, is in Length the same with the Height of the *Triglyph*.

This Order being designed to represent Solidity to us, ought not to be used but in great and massy Buildings, as the Outside of Churches and publick Places.

The Entablature here is more Massy and Tall than in the other Order, because the Strength of the Column is so much greater, it being usually $\frac{1}{4}$ of the Column. The *Cornice* must be without any Foilage or Trimming; and if you allow *Modillions*, they must be Square and Plain.

The *Freeze* here hath a regular Ornament, which are the *Triglyphs*; the *Metops* or Space between which should be exactly Square.

The Architrave of this Pillar hath also a peculiar Ornament, which are certain Pendulous Drops under the *Triglyphs*, which yet seem as it were to be fastened to it.

DORMANT, is the Herald's Term for the Posture of a Lion born sleeping, in any Coat of Arms.

DORSI LONGISSIMUS, is a Muscle which arises in Common with the *Sacrolumbalis* from the Spine of the *Os Ilium*, and the superior Part of the *Sacrum*, and all the Spines of the *Vertebra* of the Loins, Externally Tendinous, Internally Flethy: In its Ascent it is inserted to the Transverse Processes of the *Vertebra* of the Loins, and as it marches over the last Rib this great Muscle divides it self into Two, the Outermost of which is the *Sacrolumbalis*, but the Innermost next to the Spine is the *Longissimus Dorsi*, which ascends with a partly Flethy and partly Tendinous Outside, and Fibres passing somewhat obliquely outward; part of which Tendinous Fibres arise distinct from the inferior Spines of the *Vertebra* of the *Thorax* and Superior of the Loins, from which arise some Flethy Fibres ascending obliquely inwards, and are inserted to the fifth, sixth, and seventh Spine of the *Thorax*, as express by *Bidloo*, and called *Semi-Spinalis*. The other larger Part of this Muscle ascending on the *Thorax*, divides it self into many distinct Flethy Portions, not much unlike a Palm Branch, which are inserted in a twofold Manner to the Transverse Process of each *Vertebra* of the *Thorax* and Tubercle of each Rib, as also to the transverse Processes of the *Vertebra* of the Neck.

When this and its Partner acts, they are not only serviceable in keeping the Trunk of the Body erect, and bending it backwards, but they are also useful in Progression, as it may be observed when either Leg is moved forwards, this Muscle on the same Side is in Action, which seemeth to be advantageous in rendering the *Os Ilium* at that time stable, so that the Thigh may be the more commodiously elevated, in regard it is so moved by a Muscle arising from the *Vertebra* above the *Os Ilium*, namely the *Psoas*.

DORSIPAROUS and *Dorsiferous Plants*, are such as are of the *Capillary* kinds without Stalks, and bearing their Seeds on the Backsides of their Leaves: These are called by some Botanists *Epiphyllisperma*, and by others *Hypophyllisperma*: See *Capillary Plants*.

DORSUM, or *Tergum*, the Back, is the hinder Part of the *Thorax*; but the *Dorsum* of the Hand or Foot is their Outside. *Blanchard*.

DOSE, is a set Quantity of Physick, being usually as much as is given at once.

NOTE ASSIGNANDA, is a Writ that lies for a Widow, where it is found by Office that the King's Tenant was seized of Tenements in *Fee* or *Fee-Tail* at the Day of his Death, &c. and that he holdeth of the King in chief, &c. for in this Case the Widow cometh into the *Chancery*, and there maketh Oath that she will not marry without the King's Leave, and hereupon she shall have this Writ to the Escheator.

And this sort of Widow is called the *King's Widow*.

NOTE unde nihil habet, is a Writ of Dower that lieth for the Widow against the Tenant which bought Land of her Husband in his Life-time, whereof he was seized solely in *Fee-Simple* or *Fee-Tail*, in such sort as the Issue of them both might have inherited it.

DOUBLE-DESCANT: See *Descant*.

DOUBLE Horizontal Dial, invented by Mr. Oughtred, and made of Brass with a double *Gnomon*; one to shew the Hour on the Outward Circle, the other to shew the same Hour in the *Stereographic Projection* (drawn on the Plate.) This not only finds the *Meridian*, Hour, &c. but shews the Sun's Place, Rising and Setting, Declination, Amplitude, Altitude, and Azimuth, Diurnal Arch, and many useful Propositions; and may be very well applied to the making of *Dials*.

DOUBLE or Flank'd Tenaille: See *Tenails*.

DOUBLE-PLEA, in Law, is that wherein the Defendant alledgeth for himself two several *Matters* in Bar of the Action, whereof either is sufficient to effect his Desire in debarring the Plaintiff. And this is not to be admitted in the common Law, wherefore it is well to be observed when a *Plea* is *double*, and when not, for if a Man alledge several Matters, the one nothing depending on the other, the *Plea* is accounted *Double*; if they be mutually depending one on another, then it is accounted but single.

DOUBLE-VESEL, in Chymistry, is when the Neck of one *Bolt-head* or *Matrass* is put and well luted into the Neck of another; and this is used for the *Circulation* of Spirits, in order to their being exalted and refined as high as can be: See *Matrass*. Of this there are several Figures; 'tis sometimes called a *Pellican*, and also *Diotia*.

DOUBLING, in a Military Sense, is to put two Ranks or Files of Soldiers into one, so that when the Word of Command is *Double your Ranks*, then the 2d, 4th and 6th Ranks are to march up into the first third and fifth, so that of 6 Ranks they make but 3, leaving double the Interval there was between them before, which is not so when they double the half Files, because then 3 Ranks stand together, and the 3 others come up to double them; that is, the 1, 2 and 3 are doubled by the 4, 5 and 6th, or on the contrary. *Double your Files* is for each other to march to that next to it on the Right or Left, according to the Word of Command, and then the 6 Ranks are turned into 12, the Men standing 12 deep, the Distance between the Files being now double of what it was before.

DOUCINE, in Architecture, is an Ornament of the highest Part of the *Cornice*, or a Moulding cut in Form of a Wave, half *Convex* and half *Concave*.

DOWER, in Common Law, signifies that which the Wife bringeth to her Husband in Marriage, called by some *Maritagium*; but it is taken most commonly for that which the hath of her Husband after the Marriage is determined, if she out-live him, and this is the third Part of all the Lands of which the Husband was in his Life-time actually seized, in an Estate of *Fee-Simple* or *Fee-Tail*.

DRAWLER, a small Sail in a Ship, the same to a Bonnet (which see) that a Bonnet is to a Course, and is only used when the Course and Bonnet are too shoal to Cloath the Mast.

DRACO, a Constellation in the Northern Hemisphere consisting of 33 Stars.

DRACO VOLANS, with the Meteorologists, is a Fat, Heterogeneous, Earthy Meteor, appearing long and sinuous, something in the Shape of a flying Dragon; and this Shape they will have to arise from the latter Part of the Matter of this Meteor, being fired with greater Impetuosity than what comes first out of the Cloud; and they suppose the broken Parts of the Cloud, and the Sulphureous Matter which adheres to them, forms the apparent Wings of this imaginary Dragon.

DRACUNCULUS, is an Ulcer which eats thro' even a Nerve it self. *Blanchard*.

DRAWN'S Head and Tail, or the Nodes of the Moon, in Astronomy, are two Points where the Orbit of the Moon, which makes with it Angles of 5 degr. cuts the Orbit of the Sun at the *Ecliptic*, the one of them tends Northwards, the Moon being there to have *North* Latitude, and the other Southwards, where she commences *South*. This her Deviation from the *Ecliptic* seems, according to some Men's Fancy, to make a Figure like to that of a *Dragon*, whose Belly is where he has the greatest Latitude, and the Intersections represent the *Head and Tail*; from which Resemblance 'tis so called.

But *Note*, These Points abide not always in one Place, but have a Motion of their own in the *Zodiac*, and *Retrograde* almost 3 Minutes a Day, and compleat their Circle in about 19 Years; so that the Moon can be but twice in the *Ecliptic* during her Mensural Period, but at all other times will have *Latitude* as they call it.

DRAPEY, signifies, in Painting or Sculpture, the Cloathing of any Human Figures, and when the Folds of Garments hang easy and natural, and yet appear strong, we say the Drapery is very good.

DRASTICK Remedies, are those that operate quickly and effectually.

DRAUGHT Compasses, are *Compasses* with several moveable Points to draw fine *Draughts* of *Charts*, *Maps*, *Architecture*, *Fortification*, *Dialling*, &c.

DRAW, a Ship is said to draw so much Water, according to the Number of Feet she sinks into it: Thus, if fifteen Foot from the Bottom of her be under Water, or if she sink into the Water fifteen Foot perpendicular, she is said to draw Fifteen Foot Water: According as she draws more or less Water, she is said to be of more or less *Draught*.

DRAW-BRIDGE, is a *Bridge* made after the Manner of a Floor, to be drawn up or let down (as Occasion serves) before the Gate of a Town or Castle.

DRAWING Medicines: See *Epispatick*.

DRIFT-SAIL, in a Ship, is a Sail used under Water: it's veered out right a-head upon the Sea in a Storm, having Sheets fastned to it as other Sails have, its Use being to keep the Ship's Head right upon the Sea: It's also useful to hinder a Ship's driving with
a Cur-

a Current, and so generally used by Fishermen, especially in the North Seas.

DRIP, in Architecture : See *Larmier*.

DRIVE, a Ship is said to *Drive*, when an Anchor being let fall, it will not hold her fast, but that she sails away with the Tide or Wind; the best way to help which is to veer out more Cable (for the more Cable she has out, the surer and safer she rides) or else to let fall more Anchors.

Also when a Ship is a *Hull* or a *Trye*, we say she *Drives to Leeward*, or in with the Shoar, according to the Way she makes.

DROPS, in Architecture, the same with *Gutta*, which see.

DROPSY : See *Hydrops*.

DRY ; Bodies are called *Dry*, when the Pores intercepted between their more stable Parts, are not filled with any visible Liquor.

DRY *Moat* : See *Moat*.

DUCES TECUM, is a Writ commanding one to appear at a Day in the *Chancery*, and to bring with him some Evidence, or other thing, that the Court would view. There is another kind of *Duces tecum* directed to the Sheriff, upon return that he cannot bring his Prisoner without danger of Death, he being *adeo Languidus* ; then the Court grants a *Habeas Corpus* in the Nature of a *Duces tecum licet Languidus*.

DUCKUP, a Word used at Sea by the Steersman, or he that is at Helm, when either Main-sail, Fore-sail, or Sprit-sail hinder his Sight so, that he cannot see to steer by a Land Mark or the like, for then his Word is *Duckup* the Clew Lines of those Sails : And as to the Sprit-Sail, when a Shot is to be made by a Chafe Piece, and the Clew of that Sail hinders the Sight, they say, *Duckup* the Clew Lines of the Sprit-Sail; that is, hale the Sail out of the Way.

DUCTILITY, is an easy yielding Extension and Spreading of the Parts of any Metal under the Hammer, &c. and this is most remarkably the Property of Gold, whose *Ductility* is so great, as to be really wonderful ; for Mr. *Robault* tells us, That *Gold Beaters* of one Ounce of Gold, make 2790 square *Leaves* of *Gold*, each containing two Inches and ten *Lines* ; and by deducting the Wastes that are cut off (which amounts to near one half of it) the Surface of every *Leaf* of *Gold* will be found to contain 1156 square *Lines* ; so that all of them joined together Side by Side, will make a *Surface* of 315880 square *Lines*. And if the third Part be added to this, as a Consideration for the Loss in the making, 'twill follow, that *Gold-Beaters*, out of one Ounce of *Gold*, beat 4270840 square *Lines*.

DUCTUS ADIPOSI : See *Sacculi Adiposi*.

DUCTUS ALIMENTALIS, so our most accurate Anatomist Dr. *Tyson* calls the *Gula*, Stomach and Intestines, all which make but one continued Canal or *Duct* : And this *Ductus* he very truly makes the proper Characteristic of an *Animal*, or, as the Schools would express it, the *Proprium Quarto Modo*, for all *Animals* have this *Duct*, and none but *Animals*.

DUCTUS BILIARIUS, } See *Porus Bilari-*
DUCTUS HEPATICUS, } *us* ; this and the *Ductus Syficus* together make the *Ductus Communis Cholidocus*, which goes obliquely to the lower End of the *Duodenum*, or Beginning of the *Jejunum*, and after it hath pierced the first Coat, it runs near two Fingers Breadth between the Coat before it opens into the Cavity of the Intestine, which oblique Insertion serves instead of a Valve to hinder the return of the *Bile* into it again.

DUCTUS CHYLIFERUS, is a Vessel, in the lower Part whereof, called the *Receptaculum Chyli*, all the *Lacteal* Veins, and many *Lymphæducts*, are terminated. It arises about the Kidney on the Left Side, and ascending along the *Thorax* near the great *Artery*, ends at the *Subclavian Vein* on the Left Side. It is furnished with several Valves, that the Matter which ascends by it may not fall down again betwixt the fourth and sixth *Vertebra* : It is variously forked or divided. It's Use is to convey the *Chyle* and *Lympha* from the lower Parts to the Heart. This *Duct* is also sometimes called the *Ductus Communis Lympharum*, because the *Lymphatick* Vessels discharge themselves into it, and very usually *Ductus Thoracicus*.

DUCTUS CYSTICUS, is a Pipe going from the Neck of the Gall Bladder to that Part where the *Porus Biliarius* joins it ; 'Tis of the Bigness of a Goose Quill ; it goes not in a straight Line, but as it were deprest by the Liver ; several small *Biliary Ducts* open into it, and its inner Membrane hath many Wrinkles, which retard the Motion of the *Bile*.

DUCTUS PANCREATICUS, is a little Channel which arises from the *Pancreas* or Sweet-bread, running all along the Middle of it, and is inserted into the *Duodenum*, near, or not far off, the Passage which conveys the *Bile* : It carries a Juice, which it discharges into the *Duodenum*, to ferment and volatilize the Meat from the Acid Ferment of the Stomach and the Mixture of the Gall. The Learned Dr. *Graaf* got a Juice out of it that was something acid ; though others doubt of it, and of many Diseases which *Silvius* attributes to the Effervescency of this acid pancreatick Juice with the Gall in the *Duodenum*. However there is sometimes an acid Juice found in it, and often a salt and austere, but frequently an insipid Liquor. This Canal was first found by *Virtfungus*, and is frequently from him called the *Ductus Virtfungianus*.

DUCTUS RORIFERUS, (so the Noble *Bilsius* calls it) the same with *Ductus Chyliferus*.

DUCTUS SALIVARES, or *Salivarii*, are Passages which proceeding from the *Maxillary Glandules* or *Parotides*, go as far as the Jaws and Sides of the Tongue, where they emit the Juice we call *Spittle*, which conduces to the better chewing and swallowing of solid Meat, and much to its Fermentation too. *Steno* was the first who discovered the *Ductus Salivarij exterior*, as he tells us in his Book *De Musculis*.

DUCTUS THORACIUS : See *Ductus Chyliferus*.

DUCTUS UMBILICALIS : See *Funiculus*.

DUCTUS URINARIUS : See *Ureters*.

DUELLISTS, so Mr. *Boyle* calls the two Principles of those Chymical Philosophers, who will needs explicate all the *Phænomena* of Nature from the Doctrine of *Alkali* and *Acid*, and the supposed *Hostility* that there is between them, so that whenever they meet, they do as it were engage and fight a *Physical Duel*.

DULCIFIED Spirit of *Sal Armoniack* : See in *Volatile Spirit of Sal Armoniack*.

DULCIFY, when equal Parts of Spirit of Wine, and any acid Menstruum, such as Spirit of Salt, *Nitre*, *Vitriol*, &c. are digested together for 3 or 4 Day's Time, the Chymists call it *Dulcifying* the Acid Spirit ; and after that 'tis called *Spiritus Salis, Nitri, Vitrioli Dulcis*, &c.

DUM *suit infra etatem*, is a Writ which lies for him that before he came to his full Age, made a Feoffment of his Land in Fee, or for Term of Life, or

in Tail, to recover them again from him to whom he conveyed them.

DUM non fuit compos mentis, is a Writ that lieth against the Alience or Lessee, for him that not being of sound Memory, did alien any Land or Tenements in Fee-Simple, or for Term of Life, Fee-Tail, or for Years.

DUODENUM, is the first of the Intestines of Cuts, and is about 12 Finger's Breadth long; 'tis continued to the *Pylorus*, from which, turning downwards, it runs under the Stomach immediately above the *Vertebra* towards the Left Side, and ends at the First of the Windings under the *Colon*: At its lower End there are two Pipes or Canals which open into its Cavity, one from the Liver and Gall Bladder, called the *Ductus choledochus communis*, the other from the *Pancreas*, called the *Ductus Pancreaticus*. This Intestine differs from the *Jejunum* and *Ileum*, in that its Passage is straighter, and its Coats are thicker.

DUPLICATE PROPORTION, or *Ratio*, must be well distinguished from *Double*: In a Series of *Geometrical Proportionals*, the First Term to the Third is said to be in a *Duplicate Ratio* of the First to the Second, or as its *Square* is to the Square of the Second: Thus in 2, 4, 8, 16, the *Ratio* of 2 to 8 is *Duplicate* of that of 2 to 4, or as the Square of 2 to the Square of 4; wherefore *Duplicate Ratio* is the Proportion of *Squares*, as *Triplicate* is of *Cubes*, &c. and the *Ratio* of 2 to 8 is said to be compounded of that of 2 to 4, and of 4 to 8.

DUPLICATION, is the doubling of any thing, or multiplying of it by 2; also the folding of any thing back again on its self.

DURABLE FORTIFICATION: See *Fortification*.

DURA MATER: See *Mater Dura*.

DURATION, is the *Idea* which we have of the Continuation of the Existence of any thing, and is the same thing with Time, when this is mathematically and absolutely considered; but the vulgar Time is the Measure of this *Duration* taken from the Motion of the Heavenly Bodies, &c.

Mr. Lock defines *Duration* to be the *Idea* which we have of perishing Distance, of which no two Parts exist together.

DURESSE, a Term in Law, signifying a Plea used by way of Exception by him, that being cast into Prison at a Man's Suit, or otherwise by Bearing or Threats hardly used, doth unwillingly seal unto him a Bond during his Restraint; for the Law holdeth such Specialty void, but rather supposeth it to be by Constraint, and *Duresse* pleaded shall avoid the Action.

DYALLING, is the Art of describing Hour-lines truly on any given Plane, so as thereby to shew the Hour of the Day when the Sun shines.

It is founded on this Supposition, That the whole Earth is but a Point in comparison of the *Magnus Orbis*, or the Sphere of the Sun's Motion round it (or of it round the Sun;) and therefore the Hour Lines drawn on any Plane, are in Effect the same with those right Lines produced by the mutual Intersection of a great Circle of the Sphere, parallel to the Plane of the *Dyal*, and to the Planes of the several Hour Circles.

For the Plane of every *Dyal* is parallel to some greater Circle of the Sphere, which is as far from the Plane of the *Dyal*, as is the Point assigned for the Apex or Point of the Style.

The Situation therefore of the Plane is the first thing to be considered, and this, properly speaking, is only in respect of the *Horizon* or the *Meridian*.

In Reference to the *Horizon*, if a Plane lie exactly parallel to it, it is called properly an *Horizontal Plane*, and the *Dyal* drawn on it an *Horizontal Dyal*.

If the Plane be perpendicular to the *Horizon*, as all those of Walls are supposed to be, the *Dyal* described on it is called an *Erect mural Dyal*: If the Plane be oblique to the *Horizon*, it either hangs over towards you, making an acute Angle with it, and then 'tis called an *inclining Plane*, or else it falls off backward from it, making an obtuse Angle with it, and then 'tis called a *Reclining Plane*; and if it recline back equal to the Complement of the Latitude of the Place, it lies in the Plane of the Equinoctial, and is called therefore an *Equinoctial Dyal*.

In respect of the *Meridian*, a Plane is either *Direct* or *Declining*. The Plane of a *Dyal* is *Direct*, when it respects one of the 4 Cardinal Points *Directly*, or when 'tis either parallel to the *Meridian*, as are all direct *East* or *West Dyals* (which therefore are properly called *Meridional*) or perpendicular to it, as are all *Direct*, *Erect North* and *South Dyals*, which, because they lie in the Plane of the *Prime Vertical Circle*, are rightly called *Vertical Dyals* by most Authors.

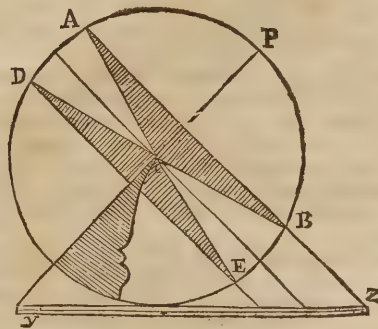
The Plane of a *Dyal* is *Declining*, when it is not directly opposite to any of the four Cardinal Points, but declines or deviates some way from the *Meridian* or the *Prime Vertical Circle*.

The Fundamental Scheme for *Dyalling*, is the Projection of the Sphere on the Plane of any particular *Horizon*, which you will find how to make under the Word *Projection*.

To find upon any *Dyal* whether the *Parallels* of the Sun's Courses, &c. will be *Parabolas*, *Hyperbolas*, *Ellipses* or *Circles*:

The Style of a *Dyal* being look'd upon as the Earth's Axis, therefore upon any Point thereof (as *c*) which being designed for the Point to trace the Parallel by, project the Sphere.

Then the Sun being in any of the *Parallels* of Declination, for Instance, as *AB* the *Tropick of Can-*



cer, will cast the Shadow of the Point *c* (the Earth's Center) in a straight Line, so that when the Sun hath performed one Diurnal Revolution, the Shadow of the Point doth trace a Conical Surface *DCE*, whose Vertex is *C*, and is similar to the Cone *ABC*: Now the Lines *CD*, *CE*, *CA*, *CB* of these Cones, may be conceived to be infinitely extended.

1. Then, whatever Plane is parallel to the Base of the Cone *DE* or *AB*, the Shadow of the Point *c* will describe upon that Plane a Circle.

2. If any Plane cut either of these Cones parallel to either of the Sides, the Shadow of the Point C will describe upon that Plane a *Parabola*.

3. If a Plane cut the Cone, and likewise one of its Sides produced beyond the Vertex, the Shadow of the Point c will describe upon that Plane an *Hyperbola*.

As here the Plane *AB* cuts the Cone *DCE*, and also the Side *DC* produced to *z*, therefore the Parallels upon that Plane are *Hyperbola's*.

4. If a Plane cuts both Sides of the Cone under the Vertex, the Shadow of the Point C will describe upon that Plane an *Ellipsis*.

DYE, in Architecture, is the Middle of the Pedestal, or that Part which lies between the Base and the Cornice; being so named, because it is frequently made in the form of a *Cube* or *Dye*, and is also called *Dado* by the *Italians*.

DYPTERON, or a *Dypterick* Figure or Order of Pillars in Architecture, is where the Temple, Edifice, &c. is environed round with a two-fold Range of Pillars in the Form of a double Portico. This *Vitruvius* tells us, *Ch. 1. Book 3.* was the Figure of the wonderful Temple of *Diana* at *Ephesus*, which was above 200 Years in Building, all *Asia* contributing to its Expence: These Columns were all of Marble, and 70 Feet high.

DYSESTHESIA, is a Difficulty of, or Fault in Sensation. *Blanchard*.

DYSCRACY or *Intemperature*, is when some Humour or Quality over-abounds in the Body. *Blanchard*.

DYSENTERY, is a Looseness accompanied with Gripings in the Belly, wherein Bloody and Purulent Excrements, and sometimes Membranous Pie-

ces of the Intestines too are excerned, always, or very frequently, attended with a continual Fever and a Drought. *Blanchard*.

DYSEPULOTICA, are great Ulcers beyond Cure. *Blanchard*.

DYSOREXIA, a want of Appetite, proceeding from an ill Disposition or diminished Action of the Stomach. *Blanchard*.

DYSPATHY, is an Impatient Temper, or a Languishing under some grievous Disease or Trouble of Mind. *Blanchard*.

DYSPEPSIA, is a Difficulty of Digestion, or Fermentation in the Stomach and Guts. *Blanchard*.

DYSPHONIA, is a Difficulty of Speech from an ill Disposition of the Organs. *Blanchard*.

DYSPNOEA, is a Difficulty of Breathing, wherein the Breath is drawn often and thick, occasioned by the Stuffing of the Lungs. *Blanchard*.

DYSTHERAPEUTA, are Diseases of difficult Cure. *Blanchard*.

DYSTHRIACHISIS, is a continual Defluxion of Tears from the pricking of Hairs in the Eye-lids, which grow under the Natural Hairs. *Blanchard*.

DYSTICHIA, is a double row of Hair on the Eye-lids. *Blanchard*.

DYSTOCIA, is a Difficulty of bringing forth; or a preternatural Birth; as when the *Fetus* comes forth obliquely, transverse, or with its Feet foremost, or when the Passages are strained by Inflammation or otherwise, or when the *Fetus* is very large, weak, fat, or dead. *Blanchard*.

DYSTRICHIASIS, is when the Hairs grow inverse. *Blanchard*.

DYSURIA, is a Difficulty of Urine, proceeding from an ill Disposition of the Organs, or from an Obstruction of them by the Stone, Gravel, or Viscous Clammy Humours, accompanied with an Heat of the Urine. *Blanchard*.

E A R. This curious Instrument of Hearing, is divided into the *External* and *Internal Ear*. The

EAR External, is composed of a Cartilage covered with a Skin very delicate, under which you meet with another Nervous Tegument, that immediately embraces the whole Cartilage; which, after some few Folds, terminates in that part of the Ear which is called the *Concha*, for its Resemblance to the Entrance of a small Shell: Besides these, it hath two Muscles;

The First is made up of certain Carneous Fibres, fixt to that part of the *Pericranium* that covers the Muscous *Crotaphytes*, and descends in a straight Line to insert it self at the upper part of the second Folding of the Ear.

The Second likewise consists of five or six Carneous Fibres, that take their Rise from the Upper and foremost part of the *Apophyses Mastoides*, and descending obliquely for about an Inch, terminate at the Middle of the *Concha*.

Arteries it hath from the *Carotides*, one Branch of which passeth behind, and the other before; and the Distribution of these is attended by Veins from the *External Jugular*.

The Hole of the Ear, is a Tube reaching from the *Concha* to the *Tympanum*, and consists partly of

a Cartilage, and partly of a Bone, the Skin that covers it is furnished with an infinite Number of Glandules of a yellowish Colour, each of which hath its Tube opening into the Cavity of the Ear, and sending forth that yellow glewy Substance, which is commonly found there: At the End of this Passage is seated the Membrane, called the *Tympanum*, or *Drum*, being almost round, dry, thin, and transparent, and is incased in a Channel cut in the Bone at the End of the Tube.

After this Membrane succeeds a Cavity called the *Barrel*, from the likeness it has to the *Barrel* of a *Drum*, being on the Sides encompassed by the Bone, closed before by that Membrane, and behind by the Surface of the *Os Petrosum*. This Barrel contains in it two Channels, two Apertures, four Bones, three Muscles, and one Branch of the *Nerve*.

The Channel that goes from the Ear to the Palate, is called the *Aqueduct*.

The Apertures, or Windows, are situated in the Superficies of the *Os Petrosum*, opposite to the *Tympanum*; the highest is the Oval-Window, in the Bottom of which is a small Edge whereon the Basis of the *Iacus* rests; the other, which is called the Round Window, has a small Channel, in which is set a very fine, dry, and diaphanous Membrane, like that of the *Tympanum*.

The first of the Bones is called *Malleus*, whose Length is about $\frac{1}{2}$ of an Inch, the Diameter of its Breadth is one Third of its Length.

The Second is the *Incus*, the longest of whose Legs is joined to the *Stapes* by the Mediation of the fourth Bone.

Of the three Muscles which are contained in this Cavity, Two belong to the *Malleus*, the Third to the *Stapes*. Lastly, The Branch of the Nerve which passes behind the *Tympanum*, has been taken by some for the Tendon of the Muscle of the *Malleus*, and is a Branch of the fifth Pair.

The two Windows open into a Cavity, which is hewn in the *Os Petrosum*, called the *Labyrinth*, divided likewise into three Parts, viz. the *Entry of the Labyrinth*, the three *Semi-circular Canals*, and the *Concha*.

The Entry of the Labyrinth is situated behind the Oval Window, and hath Nine Apertures, viz. the Oval one, and the Right one, the first of which leads into the upper Part of the *Concha*; five belong to the *Semi-circular Canals*, and the two last transmit two Branches of the softer Portions of the *Auditory Nerve*, &c.

The *External Ear* collects the Sounds, and augments the Impression by the various Reflections the Voice undergoes in its Passage thro' the Folds of it.

The Use of the Muscles is thought to contract or dilate the *Concha*, as the Tremblings of the Air are strong or weak.

In the *Internal Ear* the *Tympanum* is stretched and made slack again by the Muscles of the *Malleus*; in the Tension of it both Muscles act, but in the Relaxation, only the External, whose Action it is to reduce it from a Concave to a Plain, as is manifest from the Insertion of the Muscles; the Determination of which Action proceeds from the various Dispositions and Appulse of the Objects, as a sharp Note is caused by a Body, whose Parts are so disposed, as to be capable of very quick Vibrations, which they as suddenly impress on the Air: On the contrary, the flat Note proceeds from the slower Strokes of a Body, with Parts that can only be so agitated; to which Differences the *Tympanum* readily complies; and does, as it were, put on their particular Character; this is delivered thence to the *Malleus*, and so forward, till at last the same Fluctuation is caused in the *Os Petrosum*, and in the *Labyrinth*.

The Aquæduct serves chiefly for the Ingress and Egress of Air to and from the Cavity, into which it opens.

From the Communication of the harder Portion of the Auditory Nerve, with the Branches of the Fifth Pair, which are distributed to the Organs of the Voice, proceeds that Sympathy between Speaking and Hearing. From the Communication of other Nerves follow the Motions of the Body, and even of the Spirits, which often accompany the Sounds we hear; as in the Effects of *Musick*, &c.

EARING, aboard a Ship, is that Part of the Bolt-Rope (or Rope wherein the Sail is sewed) which at the four Corners of the Sail is left open in the Form of a Ring: The two uppermost of which four Earrings are put over the Yard-Arms to fasten the Sail to the Yard; and into the lower Earrings the Tacks and Sheets are seized, or, as they call it, are there bent unto the Clew.

EARTH: The Surface of the whole Earth Mr. Keil, in his Examination of Dr. Burnet's Theory, makes to be 170881012 *Italian Miles*, and the *Italian Mile* is little less than the *English* one.

The Orbit of the Earth (or the Circumference of a Great Circle of it) according to the *French Measures*, is 123249600 *Paris Feet*, or 24649 $\frac{40}{100}$ *English Miles*.

The Mean Semi-diameter of the Earth is 196158000 *Paris Feet*; or 3933 *Miles* (of 5000 Feet to a Mile;) But the Earth is higher at the Equator than at the Poles by 82500 Feet or 17 *Miles*.

So that the Radius of the Earth may be taken in a round Number as 200000000 Feet.

The Solid Content of the Globe of the whole Earth is 30000 000000 000000 000000 Cubick Feet.

According to Mr. *Cassini*, the Earth's greatest Distance from the Sun is 22374, mean Distance 22000, and least Distance 8022 Semi-diameters of the Earth.

On Supposition that the Sun's Parallax be 32 Seconds, which is a Mean between 40 Seconds and 24 Seconds, the Earth's mean Distance from the Sun will be 54000000 of Miles. Mr. *Whiston*.

Sir *Is. Newton* takes the Earth's Diameter, seen from the Sun, to be 24 Seconds, and consequently the Sun's Parallax to be 12 Seconds; which agrees with our Accurate Astronomer Mr. *Flamsteed*, and *Horrox's* Observations; and then the Distance from the Earth to the Sun will be much greater.

The Figure of our Earth is most probably that of an *Oblate Spheroid*, swelling out towards the Equatorial Parts, and flattened or contracted towards the Poles; so that the Diameter of it at the Equator, is longer than the Axis by about 34 Miles, according to Sir *Is. Newton*; for the Polar Diameter or Axis: Is to the Equatorial one :: As 689: To 692.

If the Earth were ever in a Fluid State, its Revolution round its Axis must necessarily make it put on such a Figure; because near the Equatorial Parts must needs be the greatest Centrifugal Force, and consequently there the Fluid would rise and swell most.

And that it should be so now, seems necessary to keep the Sea in the Equinoctial Regions from overflowing the Earth thereabouts.

Experiments also made on Pendulums, which require different Lengths to swing Seconds here, and at the Equator, prove the same thing.

And if what Mr. *Cassini* says, in *Philosophical Transactions*, Numb. 278, is certain from Experience, viz. that the Degrees of one and the same Meridian on the Earth, increase about $\frac{1}{3}$ Part as you go Southward, or are longer towards the Equator in any Proportion, then the Earth must needs be of such a Figure; as indeed is that of *Jupiter*, as appears from Observation.

The Learned Dr. *Gregory*, in his *Astronomia Geometrica* &c; *Physica*, Prop. 52. Lib. 3. shews a Method to determine the Figure of the Earth exactly, and to find the Ratio of the Axis of it to its Equatorial Diameter: And demonstrates, That the Earth must be of the Figure now mentioned, viz. an *Oblate Spheroid*.

He shews also, That the Prolate Spheroidical Figure of the Earth, is the Reason both of the Recession of the Equinoctial Points; and also, That the Earth's Axis doth twice every Year change its Inclination to the Ecliptick, and as often return back again to its former Position. *Astron. Pag. 77. Lib. 1. Prop. 64.*

The Earth's mean Revolution, in respect of the fix'd Stars, is 23 Hours, 56 Minutes.

Captain *Halley*, in his Observation of *Mercury* in the Sun at *St. Helena*, 1677. tells us, That the Annual Motion of the Earth is so exceeding swift, as far to exceed that of a Bullet shot out of a Cannon, and to be after the Rate of 3 *English* Miles and an half in a Second, which is 210 Miles in a Minute, and 12600 Miles in an Hour.

The Axis of the Earth is inclined to that of the Ecliptick, in an Angle of 66 Degrees 30 Minutes.

And tho' in one Annual Revolution, its Axis appears to keep exactly parallel to it self; yet in many Years this Position becomes sensibly changed. *Greg. Astron.*

The Earth doth not describe an Orbit round the Sun properly by her own Center, but by the Common Center of Gravity of the Earth and the Moon. And this is the Reason of the Inequality of the Earth's Motion. *Greg. Astron.*

The Earth's Horizontal Parallax to an Eye at the Sun's Surface, will be fifteen Minutes, the half of the Sun's apparent Diameter.

Our most Accurate Astronomer Mr. *Flamsteed*, found the Distance of the Pole-Star from the Pole, to be greater about the Summer Solstice than at the Winter, by about 40 or 45 Seconds; and this he saith, he confirmed by repeated Observations, made for above seven Years successively, as he acquaints Dr. *Wallis* in a Latin Letter to him in the Year 1698, which Letter is published in the Third Volume of Dr. *Wallis*'s Latin Works: And since that he hath told me, That he finds a sensible Annual Parallax in others of the fixed Stars, as well as that; and from thence he concludes (I think very justly) that the Earth must move Annually round the Sun.

As to the Reason of the Parallelism of the Earth's Axis in all Parts of its Annual Orbit, see the Word *Parallelism*.

That the Earth is nearer to the Sun in *December*, than it is in *June*; and consequently, that its Perihelion is in the Month of *December*, is plain,

First, Because the Sun's apparent Diameter is then greater than at *Midsummer*.

And also, Because the Earth moves much swifter then, by one 25th Part, than at *Midsummer*.

And from hence it is, that there are about eight Days more in the Summer Half-Year, from *March* to *September*, than in the Winter, from *September* to *March*.

Mr. *Whiston*, in his *Lemmata*, proves very easily, That the Annual Motion belongs to the Earth about the Sun, not to the Sun about the Earth.

For when from the Moon's Orbit, and the Planet's Orbits, and Periodical Times, 'tis certain, That the Law of Gravitation towards the Earth and towards the Sun is the same; and by consequence, all the Periodical Times of Bodies revolving about each of them, are in the same Proportion to one another, compared with their several Distances from each of them; on which Hypothesis this Proportion suits the Phenomena of Nature: the same must be the true one, and to be fully acquiesc'd in.

Now 'tis known, That on the Hypothesis of the Earth's Annual Motion, her Periodical Time exactly suits, and is so between that of *Mars* and *Venus*, as the Proportion observed through the whole System; but on the other Hypothesis 'tis enormously different: For when the Moon undoubtedly, and on this Hypothesis, the Sun also revolves about our Earth; and when the Distance of the Sun is to that of the Moon, as about 10000 to 46; and the Moon's Periodical Time less than 28 Days; the Periodical

Time of the Sun is by the Rule of Three discoverable thus;

As the Cube of the Moon's Distance, 46 equal to 97336: To (the Cube of the Sun's Distance 10000 equal to 100000000000, or almost as 1 to 10000000) :: So must the Square of the Moon's Periodical Time, 28 Days equal to 784: Be to the Square of the Sun's Periodical Time, 7840000000, whose Square Root 88204, are Days also, equal to 242 Years.

So that on the Hypothesis of the Sun's Revolution about the Earth, its Periodical Time must undoubtedly be 242 Years, which all Experience attests to be but a single one: So that the Controversy between the *Ptolemaick* and *Pythagorean Systems* of the World, is to a Demonstration determined, and the Earth's Annual Motion for ever unquestionably established.

N. B. This Computation is upon a Supposition, that the Sun's Horizontal Parallax is 32 Seconds, which Mr. *Whiston* takes as a middle Rate: But if you suppose it to be but 10 Seconds, which agrees much better with the Observations of our greatest Astronomers, Mr. *Flamsteed* and Mr. *Cassini*, who both make the Sun to be distant from us 11000 Semi-diameters of our Earth; then the Sun's Motion thro' the *Magnus Orbis*, will be found not to be performed in less than 597,3 Years, as any one may easily find by Calculation, as above.

He tells us also, *Lemma 56*. That if our Earth once revolved about the Sun in a Circular Orbit, whose Semi-diameter were equal to the Earth's Original Distance from the Sun, 6 Degrees past its Perihelion, the Annual Period was exactly equal to 12 Synodical or 13 Periodical Months. 'Tis evident, that 12 Synodical, or 13 Periodical Months, (equal to each other in this Case) are 355 Days, 4 Hours, 19 Minutes. 'Tis also evident, that the Eccentricity of the Earth's Orbit, or the Distance between the Focus and Center of its Ellipsis, was, according to the ancient Astronomers, *Hipparchus* and *Ptolemy*, $\frac{11}{1000}$ of the entire middle Distance. By the Moderns 'tis found somewhat less, (and those who know Sir *Is. Newton*'s Philosophy, will easily allow of some Diversity in different Ages) by *Tycho* 'twas determined to be near $\frac{18}{1000}$; by *Cassini* since $\frac{17}{1000}$; and last of all, by our most Accurate Observer Mr. *Flamsteed* $\frac{1691}{100000}$ or near $\frac{177}{1000}$, as *Cassini* had before determined.

All which considered, we may very justly take the Middle between the Ancient and Modern Eccentricity, $\frac{19}{1000}$, for the true Original one, and about $\frac{186}{100000}$, or more nicely $\frac{18,6}{1000000}$, for the Difference between the Ancient Semi-diameter of the Circular Orbit and the middle Distance in the present Ecliptick one; the Point of Acceleration being about 6 Degrees past the Perihelion, not just at it.

Then, by the Golden Rule, As the Cube of 100000 (the middle Distance in the Ellipsis): To the Cube of 98154, (the Semi-diameter of the Ancient Circle) :: So is the Square of 525949, (the Number of Minutes in our present Solar Year): To the Square of the Number of Minutes in the Ancient Solar Year, whose Root being 511459 Minutes, or 355 Days, 4 Hours, 19 Minutes, appears to be exactly and surprisingly equal to the Lunar Year beforementioned.

Upon

Upon this *Hypothesis* the Ancient Solar and Lunar Year were exactly commensurate and equal; and 11 Days, 1 Hour, 30 Minutes shorter than the present Solar Year.

EARTH, which the Chymists call *Terra Daningra*, and *Caput Mortuum*, is the last of the five Chymical Principles, and is that which remains after all the other Principles are extracted by Distillation, Calcination, &c.

EARTH-BAGS, in *Fortification*, the same with Canvas-Bags, which see.

EARTHQUAKES: Mr. Boyle thinks that *Earthquakes* are often occasioned by the sudden fall of Ponderous Masses in the Hollow Parts of the Earth, whereby those terrible Shocks and Shakings are produced.

The Learned Dr. Woodward, in his Essay towards a Natural History of the Earth, gives the following Account of *Earthquakes*, which is much the best of any I have seen.

He supposes the Subterranean Heat or Fire, which is continually elevating Water out of the Abyss, to furnish the Earth with Rain, Dew, Springs, and Rivers, when it is stopped in any part of the Earth, and so diverted from its ordinary Course by some accidental Glut or Obstruction in the Pores or Passages through which it used to ascend to the Surface, becomes by this means preternaturally assembled, in a greater quantity than usual, into one Place; and therefore causes a great Rarefaction and Intumescence of the Water of the Abyss, putting it into very great Commotions and Disorders, and at the same time making the like Effort on the Earth, which is expanded upon the Face of the Abyss; and that this occasions that Agitation and Confusion of it, which we call an *Earthquake*.

That this Effort is in some *Earthquakes* so vehement, that it splits and tears the Earth, making Cracks, and Chasms in it some Miles in length, which open at the Instant of the Shock, and close again in the Intervals betwixt them; nay, 'tis sometimes so extremely violent, that it plainly forces the superincumbent *Strata*, breaks them all throughout, and thereby perfectly undermines and ruins the Foundation of them; so that these failing, the whole *Tract*, as soon as ever the Shock is over, sinks down to rights into the Abyss underneath, and is swallowed up by it, the Water thereof immediately rising up, and forming a Lake in the Place where the said *Tract* before was.

That several considerable Tracts of Land, and some with Cities and Towns standing upon them; as also whole Mountains, many of them very large, and of great Height, have been thus totally swallowed up.

That this Effort being made in all Directions indifferently, upwards, downwards and on every side, the Fire dilating and expanding on all Hands, and endeavouring proportionably to the Quantity and Strength of it, to get Room, and make its way thro' all Obstacles, falls as foul upon the Water of the Abyss beneath, as upon the Earth above, forcing it forth which way soever it can find Vent or Passage, as well through its ordinary Exits, Wells, Springs, and the Outlets of Rivers; as through the Chasms then newly open'd; through the Camini or Spiracles of *Aetna*, or other near *Vulcano's*; and those *Hiatus* at the Bottom of the Sea, whereby the Abyss below opens into it, and communicates with it.

That as the Water resident in the Abyss, is, in all Parts of it, stored with a considerable Quantity of Heat, and more especially in those where these extraordinary Aggregations of this Fire happen; so

likewise is the Water which is thus forced out of it, inasmuch that when thrown forth, and mixed with the Waters of Wells, of Springs, of Rivers, and the Sea, it renders them very sensibly hot.

That it is usually expelled forth in vast Quantities, and with great Impetuosity, inasmuch that it hath been seen to spout out of deep Wells, and fly forth at the Tops of them upon the Face of the Ground; with like Rapidity comes it out of the Sources of Rivers, filling them so of a sudden, as to make them run over their Banks, and overflow their Neighbouring Territories, without so much as one drop of Rain falling into them, or any other concurrent Water to raise and augment them.

That it spews out of the Chasms opened by the Earthquake in great abundance, mounting up in mighty Streams to an incredible Height in the Air, and this oftentimes at many Miles Distance from any Sea.

That it likewise flies forth of the *Vulcano's* in vast Floods, and with wonderful Violence: That 'tis forced through the *Hiatus's* at the Bottom of the Sea with such Vehemence, that it puts the Sea immediately into the most horrible Disorder and Perturbation imaginable, even when there is not the least Breath of Wind stirring, but all till then calm and still, making it rage and roar with a most hideous and amazing Noise, raising its Surface into prodigious Waves, and tossing and rowling them about in a very strange and furious manner; oversetting Ships in the Harbours, and sinking them to the Bottom, with many other like Outrages.

That 'tis refunded out of these *Hiatus's* in such Quantity also, that it makes a vast Addition to the Water of the Sea, raising it many Fathoms higher than ever it flows in the highest Tides, so as to pour it forth far beyond its usual Bounds, and make it overwhelm the adjacent Country; by this means ruining and destroying Towns and Cities, drowning both Men and Cattle; breaking the Cables of Ships, driving them from their Anchors, bearing them along with the Inundation several Miles up into the Country, and there running them aground; stranding Whales likewise, and other great Fishes, and leaving them at its return upon dry Land.

That these Phenomena are not new, or peculiar to the Earthquakes which have happened in our Times, but have been observed in all Ages, and particularly these exorbitant Commotions of the Water of the Globe.

This we may learn abundantly from the History of former Times; and 'twas for this reason that many of the Ancients concluded rightly enough, that they were caused by the Impulses and Fluctuation of Water in the Bowels of the Earth; and therefore they frequently called Neptune, *Σεισθηρ*, as also *Κνωσθηρ*, *Ενοσθηρ*, and *Τινασθηρ*; by all which Epithets they denoted his Power of shaking the Earth.

They supposed that he presided over all Water whatever, as well that within the Earth as the Sea, and the rest upon it; and that the Earth was supported by Water, its Foundations being laid thereon; on which Account it was, that they bestowed upon him that Cognomen *Γασηρ*, or Supporter of the Earth, and that of *Θεμελις*, or The Sustainer of its Foundations.

They likewise believed, that he having a full Sway and Command over the Water, had Power to still and compose it, as well as to move and disturb it, and the Earth by means of it; and therefore they also gave him the Name of *Ασπληρ*, or, The Establisher; under which Name several Temples were

were consecrated to him, and Sacrifices offered whenever an Earthquake happen'd, to pacify and appease him, requesting that he would allay the Commotions of the Water, secure the Foundations of the Earth, and put an end to the Earthquake.

That the Fire it self, which being thus assembled and pent up, is the Cause of all these Perturbations, makes its own way also forth, by what Passages soever it can get vent, through the Spiracles of the next *Vulcano's*, through the Cracks and Openings of the Earth above mentioned, through the Apertures of Springs, especially those of the *Therma*, or any other way that it can either find or make; and being thus discharged, the Earthquake ceaseth till the Cause returns again, and a fresh Collection of this Fire commits the same Outrages as before.

That there is sometimes in Commotion a Portion of the Abyss of that vast Extent, as to shake the Earth incumbent upon it for so very large a Part of the Globe together, that the Shock is felt the same Minute precisely in Countries that are many Hundreds of Miles distant from each other; and this, even though they happen to be parted by the Sea lying betwixt them: And there want not Instances of such an Universal Concussion of the whole Globe, as must needs imply an Agitation of the whole Abyss.

That though the Abyss be liable to these Commotions in all Parts of it, and therefore no Country can be wholly exempted from the Effects of them; yet these Effects are no where very remarkable, nor are there usually any great Damages done by Earthquakes, except only in those Countries which are Mountainous, and consequently Stony and Cavernous underneath, and especially where the Disposition of the *Strata* is such, that those Caverns open into the Abyss, and so freely admit and entertain the Fire, which assembling therein, is the Cause of the Shock; it naturally steering its Course that Way where it finds the readiest Reception, which is towards those Caverns, this being indeed much the Cause of Damps in Mines. Besides, that those Parts of the Earth which abound with *Strata* of Stone or Marble, making the strongest Opposition to this Effort, are the most furiously shattered, and suffer much more by it, than those which consist of Gravel, Sand, and the like laxer Matter, which more easily give way, and make not so great Resistance; an Event observable not only in this, but all other Explosions whatever.

But above all, those Countries which yield great Store of Sulphur, and Nitre, are, by far, the most injured and incommoded by Earthquakes; those Minerals constituting in the Earth a kind of Natural Gunpowder, which taking Fire upon this Assembly and Approach of it, occasions that murmuring Noise, that Subterranean Thunder which is heard rumbling in the Bowels of the Earth during Earthquakes, and by the Assistance of its explosive Power, renders the Shock much greater, so as sometimes to make miserable Havock and Destruction.

And 'tis for this Reason that *Italy*, *Sicily*, *Anatolia*, and some Parts of *Greece*, have been so long and so often alarm'd and harass'd by Earthquakes, these Countries being all Mountainous and Cavernous, abounding with Stone and Marble, and affording Sulphur and Nitre in great Plenty.

That *Aetna*, *Vesuvius*, *Hecla*, and the other *Vulcano's*, are only so many Spiracles serving for the Discharge of this Subterranean Fire, when 'tis thus preternaturally assembled. That where there hap-

pens to be such a Structure and Conformation of the Interior Parts of the Earth, as that the Fire may pass freely and without Impediment from the Caverns wherein it assembles, unto those Spiracles, it then readily and easily gets out, from time to time, without shaking or disturbing the Earth: But where such Communication is wanting, or Passages not sufficiently large and open, so that it cannot come at the said Spiracles without first forcing and removing all Obstacles, it heaves up and shocks the Earth with greater or lesser Impetuosity, according as the Quantity of Fire thus assembled is greater or less, till it hath made its way to the Mouth of the *Vulcano*, where it rusheth forth sometimes in mighty Flames, with great Velocity, and a terrible bellowing Noise.

That therefore there are scarcely any Countries that are much annoyed with Earthquakes, that have not one of these Fiery Vents, and these are constantly all in Flames when any Earthquake happens, they disgorging that Fire which, whilst underneath, was the Cause of the Disaster; and were it not for these *Diverliculae*, whereby it gains an Exit, 'twould rage in the Bowels of the Earth much more furiously, and make greater Havock than now it doth.

So that though those Countries where there are such *Vulcano's*, are usually more or less troubled with Earthquakes; yet were these *Vulcano's* wanting, they would be more troubled with them than now they are; yea, in all probability, to that Degree, as to render the Earth for a vast Space around them perfectly uninhabitable.

In one word, so Beneficial are these to the Territories where they are, that there do not want Instances of some which have been rescued and wholly delivered from Earthquakes by the breaking forth of a new *Vulcano* there, this continually discharging that Matter, which being till then barricado'd up and imprisoned in the Bowels of the Earth, was the occasion of very great and frequent Calamities.

That most of these Spiracles perpetually, and at all Seasons, send forth Fire more or less; and though it be sometimes so little that the Eye cannot discern it; yet even then, by a nearer approach of the Body, may be discovered a copious and very sensible Heat continually issuing out.

EASE, in the Sea Phrase, is the same as *slack*, or let go slack: Thus, they say *Ease the Bowling*, *Ease the Sheet*, i. e. let it go slacker.

EBBING and Flowing of the Sea: See *Tides*.

EBULLITION: The great Boiling, Struggling or Effervescence which arises upon the mingling together of an Acid and an Alkalizate Liquor; and from hence any Intestine violent Motion of the Parts of a Fluid, occasioned by the struggling of Particles of different Natures, is called by this Name, *Ebullition*.

That a considerable *Ebullition* may be produced without Heat (*da veniam verbo*) nay, that a Degree of Cold may be produced greater than was in either of the Bodies singly, and that it shall arise purely upon their Mixture, though accompanied with a great Struggle, Tumult, Noise and Froth:

Mr. Boyle plainly proves from this Experiment:

He shook one Part of Oil of Vitriol into 12 Parts of common Water; the Mixture was at first sensibly warm: Then the Ball of a Thermoscope was placed within it, till the includ'd Spirit had gained the Temperament of the Mixture; but then a convenient Quantity of Volatile Salt of Sal Armoniack being

being gradually put in, to satiate the acid Spirits of the Mixture, the Spirit in the Thermoscope descended above an Inch.

EBOLICA, are Medicines which help the Delivery in hard Labour: Also Medicines which cause Abortives. *Blanchard.*

ECCENTRICITY, in the *Ptolemaick Astronomy*, is that Part of the *Linea Apfidum* lying between the Center of the Earth and of the Eccentric, (*i. e.*) that Circle which the Sun is supposed to move in about our Earth, and which hath not the Earth exactly for its Center: And the Ancients found this must be supposed, because the Sun sometimes appears large, and then it is nearest to us, and sometimes smaller, and then further off.

ECCENTRICITY Simple or Single, in the new *Elliptical Astronomy*, is the Distance between the Center of the *Ellipse* and the *Focus*; or between the Sun and the Center of the Eccentric.

ECCENTRICITY Double, is the Distance between the *Foci* in the *Ellipse*, and is equal to twice the Single Eccentricity.

ECCENTRICK Circles, are Circles not having the same Center. Of which Kind several Orbits were invented by Ancient Astronomers, to solve the Appearances of the Celestial Bodies.

The Eccentrics of the Planets they called also *Deferents*, because they seemed to carry the Body of the Planet round in their Circumferences.

ECCENTRICK Equation, in the old Astronomy, is an Angle made by a Line drawn from the Center of the Earth, and another drawn from the Center of the Eccentric, to the Body or Place of any Planet; the same with the *Prosthapheresis*; and is equal to the Difference (accounted in an Arch of the Ecciptick) between the Sun's or Planets real and apparent Place.

ECCENTRICK Place of a Planet, is that very Point of the Orbit, where the Circle of Inclination coming from the Place of a Planet in his Orbit, falls therein with Right Angles.

In *Philosop. Transact.* N. 57. there is a Geometrick Method of Signior *Cassini* for finding the Eccentricities of the Planets.

And in N. 128. there is another Direct and Geometrick Method for finding the *Apbelions*, *Eccentricities* and *Proportions* of the Orbits of the Primary Planets. By Mr. *Halley*.

ECCHOPROTICA, the same with *Catbarticum*.

ECCHYLOMA, the same with *Extradum*.

ECCHYMOMA, are Marks and Spots in the Skin, arising from the Extravafation of Blood.

Blanchard.

ECCHYMOISIS, the same with *Ecchymoma*.

ECCOPE, the same with *Extirpatio*.

ECCRIMOCRITICA, are Signs to judge of a Dissemper from particular Excretions. *Blanchard.*

ECCRISIS, is a Secretion of Excrements out of an Animal Body, or out of some Part of it.

ECHINUS, among the Botanists, is the prickly Head, Cover of the Seed, or Top of any Plant: So called from its Likeness to a Hedge-hog.

ECHINUS, in Architecture, is a Member or Ornament first placed on the Top of the *Ionick Capital*, taking its Name from the Roughness of the Carving, resembling the prickly Rind of the Chestnut, and not unlike the Thorny Coat of a Hedge-hog.

This Ornament is made use of by Modern Architects in Cornices of the *Ionick*, *Corinthian* and *Composite* Orders, and generally set next to the *Abacus*, being carved with Anchors, Darts and Ovals, or Eggs; whence 'tis called *Ove* by the French, and

Ovolo by the Italians; but the English Workmen commonly call it the *Quarter round*.

ECLEGMA, the same with a *Linctus Lambative*, *Loch*, or *Loboch*, being a Medicine design'd to heal or ease the Lungs in Coughs, Peripneumonies, &c; being usually composed of Oils and Syrups, and sometimes Powders incorporated together into a Consistence thicker than a Syrup, but not so thick as an Electuary.

ECLIPSE, is a Deprivation of the Light of one of the Luminaries, when by their Conjunction in the Orbit of the Sun, or in the Ecciptick, his Face, by the Interposition of the *Moon's* Body, is hidden from our Sight; or when by their Opposition in the same Orbit, the *Moon*, by the Shadow of the intervening Earth, is obscured.

So that in a *Lunar Eclipse*, she really loses her Light, and is obscured, by wanting the Illumination of the Sun either totally or partially. But in an *Eclipse* of the Sun, he loses not his Light, but only we are deprived of it in part by the Interposition of the *Moon's* Body between us and the Sun: And therefore this ought rather to be called an Eclipse of the Earth; for 'tis the Earth that is deprived of Light, and not the Sun.

A central Eclipse of the *Moon*, is when not only the entire Body of the *Moon* is covered by the Shadow, (which is a Total one; as when it is covered by it in Part, it is called a Partial one) but also the Center of the *Moon* passes through the Center of that Circle, which is made by a Plane cutting the Cone of the Earth's Shadow at Right Angles with the Axis, or with that Line which joins the Centers of the Sun and the Earth.

For the Method of Calculation of the Eclipses of both the Luminaries, see Dr. *Gregory's* Astronomy, Book IV. Sect. 7. and 8; and Mr. *Flamsteed's* Doctrine of the Sphere, in *Moor's* Mathematicks, Part the Second.

Because the Earth (or Sun) always moves in the Ecciptick, the *Moon* can never be Eclipsed, but when her *Plenilunium* happens in or near her *Nodes*, (that is, in the Intersection of the Plane of the Orbit with that of the Ecciptick.)

The Shadow of the Earth obscuring the *Moon*, though projected into a Cone of a vast Length, yet reaches not so far as the Planet *Mars*, for he is never Eclipsed by it, tho' he be in the Plane of the Ecciptick, and at Opposition to the Sun.

If the *Moon* be so near the *Node*, that the Aggregate of the apparent Semi-diameters of the *Moon* and of the Earth's Shadow be greater than the *Moon's* Latitude, she will be Eclipsed, otherwise not. And because the Sum of the Semi-diameter of the *Moon* and of the Earth's Shadow, is always greater than that of the Semi-diameters of the *Sun* and *Moon*; for the Former is never less than 53, and the Latter never greater than 35, 'tis plain, that *Lunar Eclipses* may happen in a greater Latitude of the *Moon*, or when she is farther from the *Node* than *Solar* ones; and in this respect, of one and the same Place upon the Earth, will more often become visible there; though in regard to the View of the whole Earth, the *Solar Eclipses* will happen more frequently.

Our most Accurate Astronomer Mr. *Flamsteed*, in the Second Part of his Excellent Doctrine of the Sphere, which is Printed in the First Vol. of Sir *Jonas Moor's* Mathematicks, gives you an Orthographic Projection of the Sphere on a Plane touching the *Moon's* Orbit, at Right Angles to the Line connecting the Centers of the Earth, Sun, or given Star, by Right Lines proceeding from any of them

to the Sphere, whereby are determined the Moon's Parallax in Altitude, Longitude, and Latitude; and by it he shews also how to determine the Breadth of the Semi-diameter of the Disk of the Penumbra, and the Earth's Shadow in an Eclipse, and how that of the Sun is made.

He teaches also very briefly and plainly, how the true Places of the Sun and Moon, her Latitude, Hourly Distance, Horizontal Semi-diameters and Parallaxes may be found by Calculation; as also, how to find the same way, the Times of the mean and true Conjunctions or Oppositions of the Luminaries; as also, the principal Phases of a Solar Eclipse for the Meridian of *London*, with the Longitudes from it, and the Latitudes of such Places as the Eclipse will be seen at, or where the said Phases shall appear; that is, where the Eclipse begins in the Vertex of the Rising, or Ends in the Vertex of the Setting Sun: Where he rises or sets Centrally Eclipsed; where the Eclipse ends in the lowest Point of the Rising, or begins in the Lowest Point of the Sun Setting; where the Sun is Centrally Eclipsed in the Meridian; and to mention no more, where the Sun is Centrally Eclipsed in the Nonagesimal Degree, without the help of Nonagesimal Tables; of which he gives an Example, and demonstrates the Reason of the *Calculus*.

He gives there also a Geometrical Construction of Eclipses, shewing how to find the exact Conjunction, &c. of the Luminaries, Digits then darkened, Inclination of the *Cusps*, End of the Eclipse, or Time when any possible Number of Digits shall be darkened, by Scale and Compass; all which is done with great Plainness, Brevity and Accuracy, and is very well worth the Mathematical Reader's Perusal.

ECLIPSIS, in a Medicinal Sense, is a Defection of the Spirits, or Fainting, or Swooning.

ECLIPTICK, is a great Circle of the Sphere; supposed to be drawn through the Middle of the Zodiack (which see) and making an Angle with the Equinoctial (in the Points of *Aries* and *Libra*) of $23^{\circ}, 20'$, which is the Sun's greatest Declination.

This is by some called *Via Solis*, or the Way of the Sun, because the Sun, in his Annual Motion, never deviates from this Line, as all the other Planets do more or less; from whence the Zodiack hath its Breadth. 'Tis this Line which is drawn on the Globe, and not the Zodiack; but in the New Astronomy, the *Ecliptick* is that Path or Way among the fix'd Stars, which the Earth appears to describe to an Eye placed in the Sun, as in its Annual Motion it runs round the Sun from West to East: And if you suppose this Circle to be divided into 12 equal Parts, they will be the 12 Signs, each of which is denoted or distinguished by some Asterism or Constellation.

Note, If the Spectator's Eye be supposed to be on the Earth, the Sun will appear always to be in the opposite Sign to what the Earth is in.

ECLYSIS, is when the Strength of the Patient is a little decayed, proceeding from a want of a sufficient Warmth and Spirits in the Body. *Blanchard*.

ECPHRACTICUM, is a Medicine good against Obstructions.

ECPHRAXIS, is a taking away of Obstructions in any Part. *Blanchard*.

ECPHYSESIS, is a Disease in which the Patient breathes thick.

ECPHYSIS, is any Process that coheres with, or adheres to a Bone.

ECPIEMA, the same with *Empiema*.

ECPIESMA, is a Juice squeezed out; also the Dregs which remain of any Thing that is squeezed; likewise a Fracture of the Skull, wherein the broken Parts press upon the Meninges or Skin of the Brain. *Blanchard*.

ECPIESMUS, is a very great Protuberance of the Eyes.

ECPLEXIS, is a Fright or Stupor.

ECPNEUMATOSIS, the same with *Expiration*.

ECTOTOSIS, the same with *Luxation*.

ECPUSTICA, are condensing Medicines: See *Incrassantia*.

ECPYESIS: See *Empiema*.

ECRITHMUS, is a Pulse which observes no Method nor Number, incident to any Age. *Blanchard*.

ECTHLIMA, is an Ulceration arising from a violent Compression in the Surface of the Skin. *Blanchard*.

ECTHLIPSIS, is a Figure in Grammar relating to the Dimension of *Latin* Verses, whereby the Letter *M*, with its preceding Vowel, is cut off, because the succeeding Word begins with a Vowel, as in this Verse;

O Curas Hominum! O quantum est in Rebus Inanis!

Where the *um* in *Hominum* and *Quantum* is entirely cut off, and not founded before the Vowels *o* and *e*.

ECTHYMATA, are Pimples or certain breakings out in the Skin, as the Small Pox, &c. *Blanchard*.

ECTHYMOSIS, is a Commotion or Intumescence of the Blood; also a Cheerfulness of the Mind. *Blanchard*.

ECTILOTTICA, are Medicines which consume Callous Parts, and pull out Hairs, &c. *Blanchard*.

ECTROPIUM, is a growing of the Eye-lids, when the lower is shorter than the upper. *Blanchard*.

ECZEMATA, are extreme hot, or, as it were burning Pimples: Some take *Hydroa* for *Eczemata*, but it is a Mistake. *Blanchard*.

EDDY, is when the Water at any Place runs back, contrary to the Tide or Stream, and so falls into the Tide or Current again. The Seamen call also that *Eddy Water*, which falls back, as it were, on the Rudder of a Ship under Sail, the *Dead Water*. They call also an *Eddy Wind*, that which returns, or is beat back from any Sail, &c.

EDULCORATION, (*i. e.* Sweetning) is a Term used by the Chymists for the clearing of any Matter from the Salts it may be impregnated or mixed with, by washing it thoroughly in common Water.

EFFECTIONS, is a Word used by Geometers, in the same Sense with the *Geometrical Construction* of Propositions, and often of *Problems* and *Practices*; which, when they are deducible from, or founded upon some General Proposition, are called the *Geometrical Effections* thereunto belonging.

EFFERVESCENCE, a Word much used by the Modern Philosophers and Chymists; it expresses a greater Degree of Motion and Struggling of the small Part of a Liquor, than we understand by the Word *Fermentation*, and implies a great Ebullition or Boiling up with some Degree of Heat; and is the usual Term for the Effect of pouring an acid Liquor, (as suppose *Oil of Vitriol*) on an *Alkalifate* one, as on *Oil of Tartar per Deliquium*; for a very great Com-

moti-

motion, struggling Heat, and boiling will immediately arise; which may be called a great *Effervescence*.

Lenery defines it to be an Ebullition or Boiling of any Liquor without the Separation of its Parts; but that doth not fully express the Meaning of the Word.

EFFLUVIUMS, are such very small Particles or Corpuscles, as are continually flowing out of all mix'd Bodies.

The very great Subtily and Fineness of the Effluvia of many Bodies, appears from their being able for a long time together, to produce sensible Effects, without any sensible, or at least, considerable Diminution of the Bulk or Weight of the Body that emits them.

And that these *Effluvia* may considerably operate upon, and have great Effect on Bodies within the Sphere of their Activity, Mr. *Boyle* proves from these Considerations;

1. That the Number of the Particles or Corpuscles emitted as Effluvia out of any Body, is *vastly great*.

2. That they are of a very *penetrating* and *permeating* Nature, and so can most easily insinuate themselves into the Bodies they operate upon.

3. That they are moved with vast Celerity, and oftentimes with all manner of Directions, and very various Modifications.

4. That there is often a wonderful Congruity or Incongruity of the Bulk and Shape of these Effluvia, to the Pores of the Bodies they penetrate into and act upon.

5. That especially in Animal and Organical Bodies, these Effluvia may excite great Motions of one Part of the curious Engine upon another, and thereby produce very considerable Effects in the Animal Oeconomy.

6. That they may have sometimes a Power to make themselves be assisted in their Operations by the more Catholic Agents of the Universe; such as Gravity, the Pressure of the Atmosphere, Light, Magnetism, &c.

EJECTION, the same with *Dejection*.

EJECTIONE Custodia, is a Writ which lieth properly against him that casteth out the Guardian from any Land during the Minority of the Heir.

EJECTIONE Firme, is a Writ that lieth for the Lessee for Term of Years; that is cast out before his Term expired, either by the Lessor or a Stranger.

EIRE, or *Eyre*, in *Britton*, Cap. 2. signifies the Court of Justice *itinerant*. And Justices in *Eyre*, are those which *Bracton* in many Places calleth *Judicarios itinerantes*, of the *Eyre*. The *Eyre* also of the Forest is nothing but the *Justice-Seat* otherwise called, which is, or should by Ancient Term, be held every three Years by the Justices of the Forest.

ELABORATORY: See *Laboratory*.

ELASTICK Force, primarily, is the Force of a Spring when bent, and endeavouring to unbend it self again.

In Physicks, 'tis taken for the Endeavour of Springing or Elastick Particles, when compress'd or crowded into a little Room, to dilate and evolve themselves again: Wherefore by this Name they frequently call such an Explofion of Animal Spirits as is frequent in Cramps or Convulsions. The Effect of this Power, or this Quality in Bodies, is called *Elasticity*; and Bodies that have it, *Elastick Bodies*.

And as a *Soft Body* is that which when press'd yields to the Stroke, and loses its former Figure, and cannot recover it self again; so an

Elastick Body is that which though it yields for a while to the Stroke, yet can afterwards recover its former Figure by its own natural Power; and if it can do this with the same Force as that which press'd upon it, we say 'tis perfectly *Elastick*.

If there were no *Elasticity*, the Laws of Motion found by Mathematicians, about the Percussion of two Bodies, would hold universally, and be without Exception true: And the Bodies (as Mr. *Keil* observes in his *Introduct. ad Veram Physicam*, P. 151.) would move jointly that way towards which the stronger Body tended before the Shock or Percussion, and with a Celerity easily determinable by those Laws of Motion. But because there are very few Bodies without some Degree of *Elasticity*, even soft Clay, Wax, &c. containing within them some Particles of Elastick Air; from hence it is, that Bodies which strike or move one against another, do spring or leap back, and move with very different Velocities, sometimes one way, sometimes another.

If you imagine a String or Wire to be strained, and fastened firm at each End, then 'tis plain, that if either the Middle Part of the String (or any other) be either drawn by the Hand, or press'd by a Weight out of the right Position it was at first in; then if the Force that removed it, be not greater than the Elastick Force of the String, the String will fly back; and if the Weight or Body be not removed, drive it before it, as the String of a Cross-bow doth the Bullet; and the acquir'd Velocity of the String will carry it beyond its first right Position towards the opposite Parts, and that so far as till the Motion that way be equal to the Elasticity of the String; and then being quite destroyed, the String will return again as before; and thus springing forward and backward; would (abstractly from the Resistance of the Medium) like a double Pendulum, make continual Vibrations. Thus also, if you suppose any Weight to fall on an immoveably fix'd and perfectly Elastick Body; on the Contact, the Parts of the Elastick Body will spring back or recede inwards, till the Elastick Force be raised up equal to the *Momentum* of the falling Body; and then this latter ceasing, the Elastick Force will cast the Body upwards or from it, with the same Velocity it came down, or was impelled against it, recovering again its former Figure; but if both the Bodies being Elastick, neither of them be fixed or moveable, then the Elastick Force will act equally in each Body, and produce equal Mutations of Motion.

And from this *Elasticity* in Bodies arises that *Re-silition* or leaping back from one another, which we observe in many Bodies on their moving swiftly one against another. The usual Method to judge whether Bodies are endowed with this Elastick Quality or not, is to enquire whether, on being struck, they give any *Tinnitus*, or ringing Sound, or indeed any sensible Noise; for if they do, you may conclude them in some Measure Elastick; and that they are so in Proportion to the Strength and Acuteness of the Sound they emit.

Mr. *Keil* gives these Rules for the Motion of Elastick Bodies.

T H E O R E M.

If two Bodies perfectly Elastick strike one against another, there will be or remain in each the same Relative Velocity as was before; that is, such Bodies will recede from each other with the same Velocity that they met together with.

For the compressive Force or the Magnitude of the Stroke in any given Bodies, arises from the relative Velocity of those Bodies, and is proportional to it: And Bodies perfectly Elastick, will restore themselves completely to the Figure they had before the Shock: or in other Words, the Resistive Force is equal to the Compressive; and therefore must be equal to the Force with which they acceded, and consequently they must by Elasticity recede again from each other with the same Velocity. Q. E. D.

COROLLARY.

Hence taking equal Times before and after the Shock, the Distances between the Bodies will be equal: And therefore the Distances of the Bodies from the common Center of Gravity will, in the same Times, be equal.

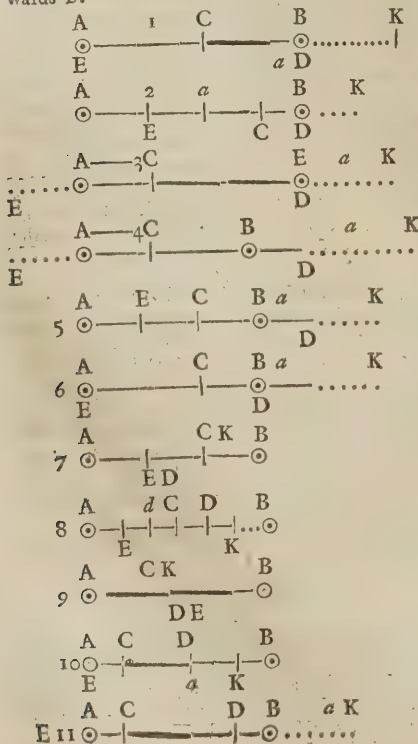
Whence the Laws of the meeting of Bodies perfectly Elastick are easily deduced, which he doth by this Problem.

PROBLEM.

To determine the Rules of the direct Meeting or Shock of Bodies perfectly Elastick.

One Construction will serve for all Cases of this Problem.

Let there be two Bodies, *A* and *B*, perfectly Elastick, whose common Center of Gravity let be *C*, and let *D* be the Point of Concourse where the Bodies meet; make *CE* always equal to *CD*. Then I say, that after the Concourse or Shock, the Right Line *CE* will express the Velocity of the Body *A* from *E* towards *A*; and the Right Line *EB* will express the Velocity of the Body *B*, from *E* towards *B*.



DEMONSTRATION.

Since the common Center of Gravity of any Bodies, proceeds on with the same uniform Progression, and with the same Velocity both before and after the Shock and Impulse, as he proves in *Theorem 18*; and that in a Time equal to that in which the Body *A* moves the Length *AD*, or the Center of Gravity *C* moves the Length *CD*; and after the Concourse, the same Point *C* will move the Length *DK* = to *DC*. This being so, let *Ka* be taken equal to *CA*; then, since by *Cor.* of the preceding *Theorem*; taking equal Times both before and after the Impulse, the Distances of the Bodies from the common Center of Gravity will always be equal; then at what time the common Center of Gravity will be in *K*, the Body *A* will be found to be in *a*; and therefore after the Impulse, its Motion will be from *D* towards *a*, and its Velocity will be expressed by *Da*, which is the Length run over in that Time: But because *CE* = *CD*, or to *KC*, and *Ca* = *Ka*, the Difference between the Right Lines *CE* and *Ca* will be equal to the Difference between the Right Lines *KD* and *Ka*; that is, *EA* = *Da*: But the Right Line *Da* expresses the Velocity of the Body *A* after the Shock or Impulse, and consequently its Velocity will also be expressed by the right Line *EA*. Besides, since the relative Velocity of these Bodies remains the same both before and after the Shock, and that the right Line *EA* denotes the Velocity of the Body *A*, the Velocity of the Body *B* must necessarily, after the Impulse, be denoted by the Line *EB*, and the Direction of the Motion will be from *E* towards *B*.

COR. I.

Hence, if the Body *B* be at rest, the Points *D* and *B* will be co-incident, as in the Case of the three first Lines in the Figure: and because *B : A :: AB : CB*, therefore, by Composition, *B + A : A :: AB : CB*; and doubling the consequent Terms of the Proportion, *B + A : 2 A :: AB : 2 CB*; that is in Words, *As the Aggregate or Sum of the Bodies : Is to the Double of the moving or striking Body :: So will the Velocity of the striking Body be before the Shock : To the Velocity of the quiescent Body after it.*

COR. II.

Wherefore if the Bodies *A*, *B* are equal, the Sum or Aggregate of them must be *2 A*: Whence the Velocity of the Body *B*, after the Shock, shall be equal to *AB*, the Velocity of the Body *A* before it; and consequently the Points *E* and *A* being co-incident, *AE*, the Velocity of the moving Body after the Impulse or Shock, will be = 0; that is, none at all. Which also may be easily shewn thus; because the Bodies *A* and *B* are equal, *AC* will be = *CB* = *CD* = *CE*; wherefore the Point *E* will co-incide with *A*, and consequently the Body *A*, after the Shock, will be at rest, and the Body *B* will move with the Velocity *EB* or *AB*.

If therefore a perfectly Elastick Body strike directly against another equal to it, and which is at rest; after the Shock the moving Body will lose all its Motion, and the Quiescent move on with the Velocity of the Former.

C O R. III.

If the Bodies *A* and *B* are equal, and both move the same way, as in Line the 4th of the Figure, they will move also both the same way after the Shock, and with the mutual Exchange of their Velocities.

For since $CE = CD$, and $AC = CB$; $CE - AC$, that is, EA , must be $= CD - CB$, or to BD ; and consequently, the Velocity of the Body after the Shock, will be equal to that of *B* before it. Besides, since $EA = BD$, EB will be $= AD$; and therefore the Velocity of the Body *B* after the Shock, must be equal to that of *A* before it.

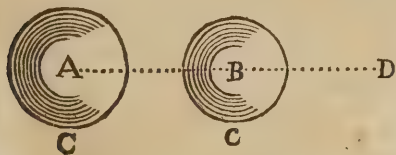
C O R. IV.

If the equal Bodies *B* and *A* move with contrary Directions, as in Line the 10th of the Figure, they will also, after the Concourse and Shock, move contrary ways, and with their Velocities counter changed.

For since $AC = CB$, and $CE = CD$, $AC - CE$; that is, AE must be equal to $CB - CD$, or to BD ; and therefore the Velocity of the Body *A*, after the Shock, will be equal to that of *B* before it. Besides, since $EA = BD$, AD will be $= EB$: But AD expresses the Velocity of the Body *A* before the Shock, and EB the Velocity of *B* after it; wherefore the Truth of this Corollary is plain.

After this he shews a very easy Method to bring these Theorems to Practice, by a Calculation in Numbers.

For suppose (1) the Bodies *A* and *B* both move the same way, and that the Velocity of the precedent Body *B* be c , and that of the subsequent *A* be C ; wherefore the relative Velocity of these two Bodies will be $C - c$, and the Sum of their Motions the same way $AC + Bc$: Let x denote the Velocity of the subsequent Body *A* after the Concourse and Shock; then because the relative Velocity of Bodies before and after the Shock continues the same, the Velocity of the Body *B* will be expressed by $x + C - c$.



For the relative Velocity of Bodies is equal to that by which the Velocity of the Swifter exceeds that of the Slower; and therefore that Excess must be expressed by $C - c$. Wherefore, since the Velocity of the subsequent Body $A = x$, its Motion towards *D* must be Ax : And since the Velocity of the preceding Body $B = x + C - c$, its Motion also towards *D* must be expressed thus, $Bx + BC - Bc$; and the Sum of these two Motions will be equal to the Sum of the former Motions: That is, in Species, $Ax + Bx + BC - Bc = AC + Bc$; and by Transposition, $Ax + Bx = 2Bc - BC + AC$; and then by Division, $x = \frac{2Bc - BC + AC}{A + B} = \text{Velocity of the Body } A$.

And so also the Velocity of the Body *B* is $= x +$

$$C - c = \frac{AC - BC + 2Bc}{A + B} + C - c = \frac{AC - BC + 2BC + AC + BC - Ac - Bc}{A + B} = \frac{2AC - At + Bc}{A + B}$$

If BC be greater than $AC + 2Bc$; then x or $\frac{AC - BC + 2Bc}{A + B}$ will be a Negative Quantity; and consequently the Velocity of the Body *A* will have a contrary Direction, and its Motion towards *D* will be Negative.

If the Body *B* be at rest, that is, if $c = 0$, then the Velocity of the Body *A* after the Shock will be $+ \frac{AC - BC}{A + B}$, forwards or backwards according as the Sign $+$ or $-$ prevails.

If the Bodies *A* and *B*, with the Velocities C and c move contrary Ways, and consequently meet one another directly; their Motion the same way will be expressed by $AC - Bc$, and the relative Velocity of the Bodies will be $C + c$.

Let then x stand for the required Velocity of the Body *A* after the Shock; its Motion that way, which it went before the Shock, will be expressed by Ax , and the Velocity of the Body *B* will be $x + C + c$ (for the relative Velocity of Bodies is not altered by the Shock) and then the Motion in the Body *B* towards *D*, will be $Bx + BC + Bc$; wherefore the Sum of the Motions the same way will be $Ax + Bx + BC + Bc$ which (by his 14th Theorem about the Laws of Motion) will be $= AC - Bc$; so that $Ax + Bx = AC - BC - 2Bc$, and $x = \frac{AC - BC - 2Bc}{A + B}$.

And the Velocity of the Body *B* will be

$$\frac{AC - BC - 2Bc}{A + B} C + c = \frac{AC - BC - 2Bc + AC + Ac + BC + Bc}{A + B} = \frac{2AC + Ac - Bc}{A + B}$$

If $BC + 2Bc$ be greater than AC , the Motion of the Body *A* will be backwards or a contrary way; in which Case x or $\frac{AC - BC - 2Bc}{A + B}$

Whatever be the Physical Cause of Elasticity; Sir Isaac Newton, Prop. 23, Book 2. of his admirable Princip. demonstrates, That "Particles which mutually avoid or fly from one another by such Forces as are reciprocally proportional to the Distances of their Centers, will compose an Elastick Fluid, whose Density shall be proportional to its Compression.

And *vice versa*, "If any Fluid be composed of Particles, that fly or avoid one another, and hath its Density proportional to its Compression, then the Centrifugal Forces of those Particles will be reciprocally as the Distances of their Centers.

ELATERISTS, Mr. Boyle's Word, are such as hold the Doctrine of *Elaterium*, or the Spring and Weight of the Air, which he defends against *Linus*.

ELATERIUM is the Juice of wild Cucumbers made up in a thick and hard Consistence: Also, according to some, any Medicine that purges the Belly.

ELECTICA: See *Atrabentia*.

ELECTION *de Clerk*, is a Writ that lieth for the Choice of a *Clerk*, assigned to take and make Bonds called *Statute-Merchant*; and is granted out of the *Chancery* upon Suggestion made, That the *Clerk* formerly assigned is gone to dwell in another Place, or hath Hindrance to lett him from following that Business, or hath not Land sufficient to answer his Transgression if he should deal ami's.

ELECTRICITY, is the Quality that Amber, Jet, Sealing-Wax, &c. have of attracting all Kinds of very light Bodies to them, when the attracting Body is rubbed or chafed. And this is most probably the Effect of a *Material Effluviu* (as the Noble Mr. Boyle expresses it in his Notes on this Quality) issuing from, and returning to the *Electrical Body*, and assisted also in some Cases by the External Air. For the Solution of this Phenomenon there are several Hypotheses, and all Mechanical.

1. *Cabvus* supposes, That actual Streams do issue out of the *Electrick Body* when agitated by Attrition; and that these do diffusi and repel the Ambient Air, which, after it hath been driven off a little way, makes, at it were, a little Whirl wind from the Resistance which it finds in the remoter Air, to which these *Electrick Streams* did not reach: And that the Streams shrink quickly back again to the attracting Body, do, in their Return, attract or bring along with them such light and small Bodies as they meet with in their way. To which Mr. Boyle adds, that the Gravity of the incumbent Atmosphere surmounting the specific Gravity of the little rarified Atmosphere of the *Electrick Body*, may probably facilitate the Tendency of the small Particles of Matter towards the attracting Body.

2. Our Famous *Gilbert*, Sir K. Digby, *Gassendus*, Dr. Brown, and many others, suppose, That on rubbing or chafing, the *Electrick Body* is made to emit Rays or Files of an unctuous Nature, which, when they come to be condensed and cooled by the Ambient Air, do lose their Agitation, and then shrink back again into the Body from whence they fall'd out; and by that means do carry along with them such light and small Bodies as happen to be fastened or sticking to their further Ends. *Gassendus* thinks also, That these unctuous Effluvia being emitted all manner of ways, do decussate frequently, or cross one another; and by this Means do take the better hold of Straws, &c. into whose Pores they insinuate themselves.

3. *Des Cartes* being not able to imagine that so solid a Body as Glass was capable of emitting Effluvia; (tho' it is certain that two Pieces of Glass rubbed one against another, will send forth an unpleasing Odour, which must consist of material Effluvia) he had recourse to the Operation of his *Materia Prima* for the Solution of *Electricity*; but he speaks of it doubtfully himself, and unintelligibly to the Reader, as it appears to me; therefore I shall refer you to the Place it self, where if you think it worth while, you may see what he saith at large. *Vid. Cartes Princip. Lib. 4 Chap. 184. p. 210.*

Mr. Boyle, in order to prove *Electricity* to be a Quality which hath, like all others, in natural Bodies, a Mechanical Original, hath given us the following Observations and Experiments about this Effect; from whence a very good guess may be made how *Electrical Attraction* is produc'd, viz.

1. That *Electrical Bodies* do not at all, or at best but very rarely attract, but when they are warm'd, and thereby sollicit to emit Effluvia more copiously.

2. That these Bodies warm'd only by the Fire, don't attract so forcibly as they will when heated

by rubbing; tho' if they are first warmed at the Fire, and then rubbed afterwards, they will attract most speedily and powerfully. So that Heat seems necessary in general to put the Parts into Agitation; and rubbing or chafing in particular, to give them their most proper Modification.

3. *Tersion* (as he calls it) or *Wiping*, is almost universally necessary, as well as Attrition or Rubbing, to produce *Electricity*; for thereby the Steams or Effluvia can the better get out, when there is nothing to stop up, or choak the Pores of the attracting Body.

4. The *Magnetical Effluvia* will pervade all manner of Bodies freely; yet the Interposition of the finest Linnen or Paper will hinder the Operation of all *Electrical Particles*; which seems to confirm their being something of an unctuous Nature.

5. This Effect is very much weaken'd if the Weather be thick and cloudy, and especially if the South Wind blow, as *Kircher* asserts from his own Experience. But it always continues some time after it is once excited by rubbing and chafing, and doth not cease in an Instant.

6. *Electrical Bodies* attract all Things indifferently, whereas the Magnet draws only Iron and Steel.

7. Our Excellent Naturalist suspended a fine large Piece of very *Electrical Amber* by a Silken Thread, and then had one end of it rubbed strongly on a little Cushion, and then he found that when the Amber was made to hang perfectly at rest, if the Cushion was brought near it, tho' not to touch it, it would plainly make the Amber tend towards it, and follow it. From whence it plainly appears, that other Bodies can draw or move the *Electrick one*, as well as it, the others; and that it is by Accident only, and not from Necessity, that the small attracted Bodies go to the *Electrick one*.

8. By many repeated Experiments he found this *Electrical Quality* to be producible and destructible.

9. He found also that a Piece of Amber did sensibly attract when the Air was pumped out of the Receiver; which confirms the Hypothesis of those that suppose actual Strings or little unctuous Rays to go out of the *Electrical Body*.

10. He found also, that after an *Electrical Body* had been well rubbed, there was a certain Nick of Time in which the light Body would instead of being attracted, be actually driven away from the *Electrical Body*, by the Effluvia going briskly out and not yet returning again; which much confirms the Hypothesis of *Gilbert*, *Digby*, *Brown*, &c. mentioned in N. 2. See Vol. II.

ELECTUARY, is a Medicine of a Consistence, thicker than a Syrup or Linctus, and composed of hard things reduced to Powder, and accurately mixed with Syrups, Conerves, Honey, &c.

ELEGIT, is a Writ Judicial, that lieth for him that hath recover'd Debt or Damages in the King's Court against one not able in his Goods to satisfy, and directed to the Sheriff, commanding him that he make Delivery of half the Parties Lands or Tenements, and all his Goods, Oxen and Beasts of the Plow excepted.

ELEMENTS, is a Word used by Natural Philosophers, in the same Sense usually as *Principles*; and by the Elements and Principles, or as they sometimes call them the *Elementary Principles* of a Natural or Mixed Body, they mean those simple Particles out of which the Mixed is composed, and into which 'tis ultimately resolved.

The Word comes from L, M, N, three of the Letters of the Alphabet; and is also frequently used for the first Principles or Rudiments of any Science.

Thus

Thus the Propositions of *Euclid* are called his Elements, because they contain the first Principles of Geometry.

ELEOSACCHARUM, is Sugar incorporated with some Drops of distilled Oil, so as to make the Oil more easy and agreeable to be swallowed by the Patient.

ELEPHANTIASIS Arabum, of which the *Greeks* speak nothing, but the *Arabians* do frequently, is a kin to a *Varix* or crooked Swelling in the Veins, and proceeds from thence, and is only a Tumour in the Feet. *Avicenna* treats of this Distemper, where he speaks of the *Varices*; yet *Rhazes* differs from him, and *Haly Abbas* follows the *Greeks*, who say, That an *Elephas* is a Disease which corrupts all the Members of the Body, and is as it were, an *Universal Cancer*. But neither is he consistent with himself, when he writes, that *Ulcers* in the Legs and Feet are called *Elephas*; and that *Elephantiasis Morbus* is an Apostume proceeding from Melancholly in the Legs and Feet; and the Sign of it is, That the Shape of the Foot is like the Figure of an Elephant. All the rest treat separately of a *Leprosy* and an *Elephantia*, and make the latter to be a Swelling of the Feet, proceeding from Melancholly and Pituitous Blood, and the crooked Swelling of the Veins, whereby the Feet resemble the Feet of an Elephant in Shape and Thickness: And this sort of Tumour is often seen in Beggars who wander much. *Blanchard*.

ELEPHANTIASIS Græcorum, which the *Arabians* call a *Leprosy*: It is called also *Elephas*, *Elephantiasis*, and *Elephantia*, from an Elephant, as some think, because it makes People big like an Elephant, which is a foolish Notation of the Word; for the Body is no bigger, though the Disease be. Others think 'tis so called, because the Distemper lying in the Legs, maketh them stiff and equal like an Elephant; or because 'tis a strong vehement Disease like an Elephant, with such like Stuff. *Galen*, in his 14th Chapter of Tumours, says, that "This Disease is called a *Saturiasmus* when first it begins, because it makes the Face like that of a Satyr; for the Lips are thick, the Nose swells, the Ears Decay, the Jaws are red, the Forehead is set with Tumours like so many Horns." Though others think it is called *Saturiasmus*, because the Persons afflicted are much inclined to Leachery at the beginning, as Satyrs are. *Celsus* describes it thus: "The whole Body (says he) is so affected, that the very Bones may be said to be corrupted. The upper Parts of the Body are full of Spots and Tumours, the Redness whereof is gradually turned into Black: The Top of the Skin is unequally thick, thin, hard, soft, rough, as if it had Scales on it; the Body decays, the Bones, Calves of the Legs, and Feet, swell. When the Disease is old and inveterate, the Toes and Fingers are hid in the Swelling, and a small Fever arises, which easily consumes a Man laden with so many Infirmities. *Blanchard*."

ELEVATION of a Mortar-piece or Gun, is the Angle which the Chase of the Piece, or the Axis of the hollow Cylinder, makes with the Plane of the Horizon.

ELEVATION of the Pole, is the Height or Number of Degrees that the Pole, in any Latitude, is raised, or appears above the Horizon.

ELEVATION of the Pole, in Dyalling, is the Angle which the Style makes with Subtylar Line.

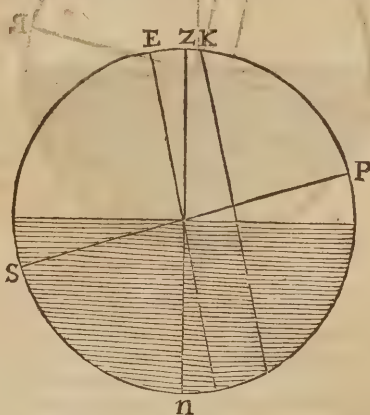
To find the Elevation or Height of the Pole, having given the Declination and Meridian Altitude or Zenith Distance of the Sun or Star.

Note, 1. If the Sun or Star have no Declination, the Zenith Distance is the Latitude or Height of the Pole; and if the Sun or Star come to the Meridian due North, the Latitude is Southerly; if it come to the Meridian South, the Latitude is Northerly.

2. If the Sun or Star be in the Zenith, the Declination is the Latitude; and if the Declination be Southerly, the Latitude is Southerly; but if the Declination be Northerly, the Latitude is Northerly.

Rule 1.

If the Declination be North or South, and the Meridian Altitude be the same way that the Declination is, the Difference between the Declination and Zenith Distance, is the Height of the Pole towards which the Declination is.

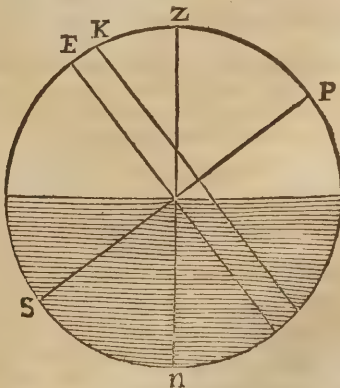


Example 1.

Declination North, — 23°. 30'. EK.
Zenith Distance North, — 8. 30. ZK.
Latitude North, — 15. 00. EZ.

But if the Declination be less than the Zenith Distance, then the contrary Pole to the Declination is elevated: As,

Zenith Distance South, 48°. 30'. ZK.
Declination South, — 20. 00. EK.
Latitude South, — 28. 30. EZ.



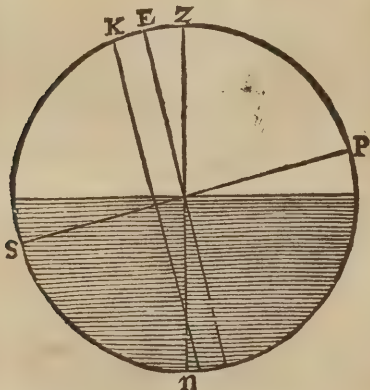
Example

Example 2.

Zenith Distance North, $50^{\circ} . 00'$.
Declination North, — $15 . 00$.
Latitude South, — $35 . 00$.

Rule 1.

If the Sun or Star's Declination be North or South, and the Zenith Distance be contrary to the Declination, the Sum of the Co-altitude and Declination is the *Height of that Pole* that the Declination is towards.



Example.

Zenith Distance South, $31^{\circ} . 30'$. ZK.
Declination North, — $20 . 00$. EK.
Latitude North, — $51 . 30$. ZE.

Note, If the Declination be the same way that the Meridian Altitude is, and greater than the Meridian Altitude, then the Sun or Star may have two Meridian Altitudes in 24 Hours, viz. the one above the Pole, and the other below.

In such Case the Sum of the Co-declination and Altitude, is the *Height of the Pole* towards which the Declination is.

Example.

Declin. North $21^{\circ} . 30'$. its Compl. $68^{\circ} . 30'$.
Meridian Altitude North, — $10 . 30$.
Elevation of the North Pole, — $79 . 00$.

But if the Meridian Altitude be greater than the Declination, then the Difference between the Zenith Distance and Co-declination, is the *Height of the Pole* towards which the Declination is.

Example.

Declination North, $22^{\circ} . 30'$.
Zenith Distance, — $10 . 30$. North.
Latitude North, — $12 . 00$.

Note, Which way soever the Meridian Altitude be, if the Meridian Altitude and twice the Co-declination be less than 180 Degrees, the Sun or Star hath two Meridian Altitudes in 24 Hours, and the Latitude is found by the 2d Rule.

Example.

Meridian Altitude South, — $77^{\circ} . 00'$.
Decl. $62^{\circ} . 00'$. North Compl. $28 . 00$.
Sum, $133 . 00$.

Which is less than $180^{\circ} . 00'$. Therefore,

Zenith Distance South, $15^{\circ} . 00'$.
Declination North, — $62 . 00$.
Latitude North, — $75 . 00$.

ELEVATOR, the same with *Elevatorium*.

ELEVATOR *Labii Inferioris*, is a Muscle which, with its Partner, lies within the lower Lip. They arise fleshy from the inferior Part of the Gums of the lower Jaw which belong to the *Dentes Incisivos*, and descend directly to their Implantations in the Inferior Part of the Skin of the Chin. Hence it is, when these act, they make divers Indentations in the Chin, as may be observed in living Persons, when the lower Lip is drawn upwards.

ELEVATOR *Labii Superioris*, is a Muscle which arises fleshy from the Fore-part of the *Os Quatum* of the upper Jaw, immediately above the *Elevator Labiorum*, and descends obliquely under the Skin of the upper Lip, joining with its Partner in a middle Line from the *Septum Narium*, to its Termination in the *Sphincter Labiorum*. Its Name shews its Use.

ELEVATOR *Labiorum*, is a Muscle which lies between the *Zugomaticus* and the *Elevator Labii Superioris Proprius*. It arises from the *Os Quatum* of the upper Jaw, and descends to its Inferion under the Termination of the . . . Its Name shews its Use.

ELEVATOR *Oculi*, is a Muscle of the Eye, called *Superius* from its Moral Signification, it being one of the common Marks of a haughty Disposition to look high; wherefore its opposite Muscle is called *Humilis*. This Muscle arises sharp and fleshy near the Place where the *Optick Nerve* enters the *Orbit*; and becoming a fleshy Belly, makes a thin Tendon inserted to the *Tunica Scleratis* on the Superior and Fore-part of the Bulb of the Eye under the *Adnata*.

ELEVATORES, or *Elevating Muscles*, are those that serve to draw the Parts of the Body upwards.

ELEVATORIUM, so called from the lifting up, is a Chyrurgeon's Instrument, wherewith Pieces of Skulls that are depressed are raised up again.

ELIXATION, is the boiling of any thing for a Medicinal Use in a proper Liquor, in order that the thing may impart its Vertue to the Liquor 'tis boiled in.

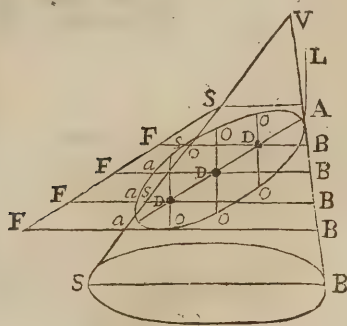
ELIXIR, the Chymist's Name for a very fine and useful Tincture; as *Elixir Proprietatis*, *Solutis*, &c.

ELIXIR *Proprietatis*, is a Tincture of Myrrh, Aloes and Saffron, drawn by Spirit of Wine and Spirit of Sulphur. This is *Paracelsus* his way, and is really the best of any, though many others are prescribed.

ELIPSIS, in Grammar, is that Figure whereby some Part of our Discourse is left out or retrenched: As in the Latin Expression *Paucis te volo*, in which Words *verbis alloqui* are left out. This Figure is very common in the Oriental Languages.

ELLIPSIS, in Geometry, is an Oval Figure; 'tis produced from the Section of a Cone by a Plane cutting both sides of the Cone (but not parallel to the Base, for then it produces a Circle) and meeting with the Base produced, as $FDKEO$ in the second Figure following.

But first I will give you Dr. Wallis's General and Geometrical Way of demonstrating the General Property of the *Ellipse*, and which he expresses thus.



PROP. I.

In the Ellipse the Squares of the Ordinates are equal to the Differences between two Rectangles, of which the Greater are as the Abscissa; the Lesser as the Squares of the Abscissa.

For,

1. The Squares of DO are = Rectangles $BD \times DS$ every where, because SB is the Diameter of a Circle.

2. Drawing then SF parallel to Aa , the *Latus Transversum*, and producing the BS 's every where to F , the Lines DS will every where be = $DF - FS$, where the DF 's are all equal, because SF parallel Aa .

3. You will find also, That the Rectangles under BD and DS (= DO q) will be = to the Rectangle under BD and DF , deducting that under BD and FS : That is, $BD \times DS = BD + DF - BD \times FS$.

4. Also because the DF 's are all equal, the Rectangle BDF will still be as the BD 's; and those BD 's, because of the similar Triangles ADB , will still be as the DA 's, or the Abscissa. Wherefore the Rectangles BDF will every where be as the Abscissa AO ; which is the Proof of the first Part.

5. But the Squares $BD \times FS$, since both the BD 's and FS 's are every where as the AD 's, must be in a duplicate Ratio of, or as the Squares of the Abscissa AD .

6. Wherefore, since the Square of the Ordinate DO (= $DB \times DS$) is equal to $BD \times DF - BD \times FS$ (Prop. 3.) the Proposition is plain.

COROLLARY I.

Hence 'tis plain, That if you have the Right Lines BD and DS , you have the Ordinate DO , but *à contra*, because the Lines BD , DS may vary infinitely, and yet make a Rectangle equal to DO q. Wherefore the Conick Writers thought to determine the Ordinates another Way; for instead

of BD , they took in the Section the Line AD , or the Abscissa; and instead of AS they substituted another imaginary Line, suppose LA (which they called the *Latus Rectum*) and ordered it, so, that it should be a fourth proportional reciprocally to the Lines AS , BD and DA : So that every where it should be $BD \times AS = DA \times LA$, and consequently the *Latus Rectum* = $\frac{BD}{AD} \times AS$,

and $AS = \frac{DA}{BD} \times LA$.

PROP. II.

The Square of any Ordinate (IK) in the Ellipsis, is equal to the Rectangle (IL) under the *Latus Rectum* (EL) and the Abscissa (EI) less, or abating out of it another Rectangle made by the same Abscissa (ED) and a fourth Proportional (RS) to the *Latus Transversum*, the *Latus Rectum* (DE) and the Abscissa.



Draw a Parallel to the Section, as MB , which note with b , and continue the Axis of the Section till it meet with the Diameter of the Base of the Cone produced in the Point F , and draw it on to M , and call AM , c .

Draw also the *Latus Primarium* EP , and parallel to it NO through any given Point, I : Call the Side of the Cone, in which the upper Vertex of the Section is, a . Let the Abscissa EI be noted with eb ; and then (working by the similar Triangles BCA and EIN) according to the Rule of proportions, NI will be expressed in this Notation by ec . Let the produced part of the Base MC be called d ; and the *Latus Transversum*, or Transverse Diameter ED , be called ob : Then will ID be = $ob - eb$.

Since the Triangles BMC , DEP , and DEO are all Similar, work for a fourth proportional to express EP , and you will find it to be ed ; and IO in this Notation (by the same Way of working) will be $ed - ed$.

Here also, as in the Parabola and Hyperbola, the Square IK = Right-angle NIO , which you will find in the *Ellipsis*, must be noted by $oeed - eecd$; as in the Hyperbola (you may see) 'tis $oeed + eecd$.

If therefore you divide $oeed - eecd$ = the Square of the Ordinate IK , by EI the Abscissa in this Notation = eb , it will stand thus, $\frac{oeed - eecd}{eb}$, or $\frac{ecd - ecd}{b}$, which is equal to the Line IS , and which, with the Abscissa $EI = eb$, will make ES a Rectangle = to IK Square.

And if you work here to find the *Latus Rectum*, according to the Canon given in the Parabola, by saying, as $b : c :: od : \frac{odc}{b}$, you will have $\frac{odc}{b}$ for

COROLLARY I.

In any *Ellipsis*, draw an Ordinate as IK , and suppose the Focus to be in N , and the *Latus Rectum* LM applied in N at Right-angles to the Axis.



Then will the Square of $\frac{ocd}{2b}$ ($= \frac{1}{4}$ the *Latus Rectum*) = Square of LN be $= \frac{occd}{4bb}$. Wherefore by this Proposition, As Square IK : Square LN :: Rectangle DIE : Rectangle DNE ; that is, $occd - eecd : \frac{occd}{4bb} :: oebb - \frac{occd}{4}$. Wherefore the Rectangle DNE ; $= \frac{occd}{4}$.

Now Rectangle DNE + the Square of CN = Square CE (by 5. e. 2. *Euclid*) and consequently CN Square = CE Square - Rectangle DNE : that is, $\frac{oebb}{4} - \frac{occd}{4}$ (for $CE = \frac{1}{2} ob$). And therefore CN , the Distance from the Center to the Focus, is equal to $\frac{\sqrt{oebb - oecd}}{4}$.

COROLLARY II.

And from hence will arise this Canon for determining the Foci of an *Ellipsis* from the Square of half the *Latus Transversum*; Subtract the fourth part of the Figure. (or $\frac{1}{4}$ of the Rectangle under the *Latus Rectum* and *Transversum*) and then extract the Square Root of the Remainder: That shall be the Distance of the Focus from the Center, and then subtract that from half the *Latus Transversum*, and it gives EN the Distance of the Focus from the Vertex.

COROLLARY III.

Which Rule is very easy in Practice, for $\frac{oebb}{4}$ is only the Square of CE (half the *Latus Transversum*) and $\frac{occd}{4}$ nothing but the Rectangle of $\frac{1}{4}$.

CE into LM the *Latus Rectum* (for $\frac{ob}{4} \times \frac{ocd}{b} = \frac{occd}{4}$.)



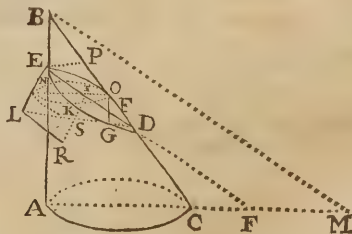
Wherefore find MN a mean Proportional between LM and $MO = \frac{1}{4} DE$; then on CM ($= CE$) describe a Semi-circle, and in it apply MN , and then draw CN , which shall be the Distance of the Focus from the Center.

COROLLARY IV.

Since in *Cor. I.* 'twas proved, that the Rectangle DNE + CN Square $= CE$ Square; that is, Rectangle $DNE = CE$ Square - CN Square. Call CN Square, mm ; and then will the Rectangle $DNE = (CE$ Square) $\frac{oebb}{4} - mm$: Which Notation, as one of the same Nature in the Hyperbola, will be of use hereafter.

PROP. IV.

In the *Ellipsis*, The *Latus Rectum*: Is to the *Latus Transversum* :: As the Square of any Ordinate, IK : Is to the Rectangle DIE , made by the Lines intercepted between it and the Vertices of the *Latus Rectum*.



For the *Latus Rectum* is $\frac{ocd}{b}$, and the *Latus Transversum* ob ; the Square of the Ordinate $oecd - eecd$, and the Rectangle DIE is $oebb - eebb$, IK is b , as hath been shewn in the former Propositions: Place therefore these four Quantities in the Form of Proportionals, viz.

As $\frac{ocd}{b} : ob :: oecd - eecd : oebb - eebb$.

And multiplying the Extremes and Means, you will find the same Quantity $oebbcd - oeebcd$ produced both ways, which shews they are truly proportional. Q. E. D.

COROLLARY I.

Wherefore, if the *Latus Rectum* and the *Axis Transversus* be given in the *Ellipsis*, 'tis easy to find the second Axis, by making, As $ob : \frac{ocd}{b} :: \frac{oebb}{4}$ ($=$ Rectangle DCE) : To $\frac{occd}{4} =$ Square AC .

Wherefore AC is known, and consequently its Double AB .



Whose Square must be $oocd$ = Rectangle of the *Latus Rectum* into the *Transversum*; i.e. the Figure, as Apollonius calls it. Wherefore the *Axis Secundus*, and any Second Diameter, is a mean Proportional between the *Latus Rectum* and *Transversum*; or to speak with Apollonius, is equal in Power to the Figure.

COROLLARY II.

Since the Square of $AC = \frac{oocd}{4}$, and the Squ. of CN (the Distance of the Focus from the Center) = $\frac{oobb - oocd}{4}$, by Corol. 1. of Prop. 2. Put them into one Sum, and they will make $\frac{oobb}{4}$, which therefore must be equal to Square AN , and consequently the Line $AN = \frac{ob}{2}$; i.e. to half the *Latus Transversum*.

Wherefore, if you have the Axes in an Ellipsis, 'tis easy to find the Foci; for you need only open the Compasses to the Distance DC , and setting one Foot in A , cross the *Transverse Diameter* in the Points N and N .

COROLLARY III.

Since by Cor. 1. Prop. 2. the Rectangle DNE has been proved equal to $\frac{oocd}{4}$, which, by Cor. preceding, = AC^2 , 'tis plain Rectangle $DNE = AC$ Square.

COROLLARY IV.

The Square of CE (= half the *Transverse Diameter*) : Is to the Square of AC half the Diameter *secunda* :: As *Latus Transversum* : To *Latus Rectum*.
For $\frac{oobb}{4} : \frac{oocd}{4} :: oobb : oocd :: obb : ocd$
:: $\frac{oobb}{b} : \frac{oocd}{b} :: ob : \frac{oocd}{b}$; i.e. *Latus Transversum*, *Latus Rectum*.

COROLLARY V.

Also since CE Square : AC Square :: ob : $\frac{oocd}{b}$; that is, by this Prop. As Rectangle DIE : Square IK . Therefore Square CE : Square AC :: Rectangle DIE : Square IK ; that is also (by Cor. 3.) As Square CE : Rectangle DNE :: Rectangle DIE : Square IK .

COROLLARY VI.

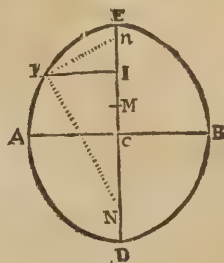
Wherefore there will be found a new and useful Way of expressing the Square of the Ordinate IK (which we found above in Prop. 1. was $oocd - eecd$) if you make, As CE Square ($= \frac{oobb}{4}$):

Rectangle $DNE = (\frac{oobb}{4} - mm)$, by Corol. 4. Prop. 2.) :: So Rectangle DIE : To a fourth Proportional; which working Algebraically by the Rule of Three, will be found to be $oebb - eebb - 4emm - 4mnee$

The Advantage of which Notation will sufficiently appear in the next Proposition.

PROP. V.

In the Ellipsis, the Aggregate or Sum of the Right Lines KN and Kn , drawn from the same Point K , in the Curve of the Ellipsis, to both the Foci N and n , is always equal to the *Transverse Diameter* or *Axis DE*.



The Proof of which depends on the Consideration, of the Rectangled Triangles IKN and IKn , where the Sides being given, the Hypothenuses are easily had.

For if (as in Cor. 4. Prop. 2.) you call $CN = m$, then will m be $\sqrt{oobb - oocd}$, and $IN = CI$

+ $CN = \frac{1}{2}ob - eb + m$; but In will be = $Cn - CI = m - \frac{1}{2}ob + eb$.

Wherefore the Square of $IN = \frac{1}{4}oobb - oebb + eebb + obm - 2ebm + mm$; and the Squ. of $In = \frac{1}{4}oobb - oebb + eebb - obm + 2ebm + mm$.

Now if to each of these Squares you add the Square of IK , which (by Cor. 6. of the precedent) was $oebb - eebb - \frac{4emm}{4} + \frac{4mnee}{4}$, the Sum will be KN Square (or the Square of the Hypothenuse) which is = $\frac{1}{4}oobb + obm + 2ebm + mm - \frac{4emm}{4} + \frac{4emm}{4}$.

And Square $Kn = \frac{1}{4}oobb - obm + 2ebm + mm - \frac{4emm}{4} + \frac{4emm}{4}$

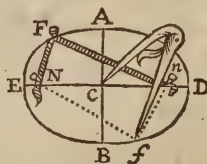
And consequently extracting the Roots of those Equations (which is very easy) you will have $KN = \frac{1}{2}ob + m - \frac{2em}{e}$, and $Kn = \frac{1}{2}ob - m + \frac{2em}{e}$.

Which

Which two added together, are manifestly equal to ob the Transverse Diameter. *Q. E. D.*

COROLLARY I.

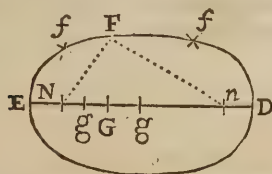
From whence arises the Reason of the Ordinary Way used by Gardeners, &c. to describe Ovals or Ellipses by two Pins in the Transverse Diameter at N and n , and a String mov'd about them by another Pin,



as F ; for by this Means the Point F will always be in the Ellipse; and since a Circle is described by a String moving round one Pin placed in the Center, 'tis plain a Circle is an Ellipse, whose Foci are coincident.

COROLLARY II.

Hence also 'tis easy to describe an Ellipse on a Plane Geometrically, by only Scale and Compasses: For



having drawn the Axis Transversus DE , and in it taken the Foci n and N ; at a Distance, not more than half the Transverse Axis, with the Compasses in N strike an Ark, as f , and set the same Distance from E to G .

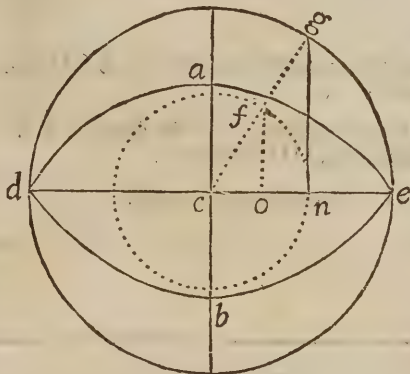
Then opening the Compasses to the remaining Distance GD , with one Foot in n cross the Ark f , and that Point will be in the Ellipse: And thus you may find as many Points as you please with all Readiness imaginable.

ELLIPTICAL Compasses, is an Instrument made in Brads, to draw at one Revolution of the Index, any Ellipse or Oval.

ELLIPTICAL Dial, is an Instrument made commonly of Brads, with a Joint to fold together, and the Gnomons to fall flat, commodiously contrived to take little room in the Pocket. By it may be found the true Meridian, Hour of the Day, Rising and Setting of the Sun, with several other Propositions of the Globe.

ELLIPTICAL Space, is the Area contained within the Curve of the Ellipse.

The Elliptical Space $d a e b$: Is to a Circle described on the Transverse Axe de : As the Conjugate Diameter, or Axis Rectus ab : Is to the Transverse Axe de .



Draw fo , gn perpendicular to Ce .

Then will $fo : fc :: gn : gc$.
And therefore $fo : gn :: fc : gc$.
 $:: ac : ce$.
 $:: ab : de$.

But this Proportion of $fo : gn :: ab : de$ will be true, wherever the Perpendiculars fo and gn are drawn; that is, of all the Indivisible of the outer Circle and Ellipse: Wherefore the Plane Spaces made out of them, must, in the whole, be in the same Proportion to one another: That is, the Ellipse to the Circle, is as the Conjugate ab , to the Transverse Diameter de . *Q. E. D.*

COROLLARY I.

Wherefore the Quadrature of the Ellipse will be had, when that of the Circle is found, and vice versa.

COROLLARY II.

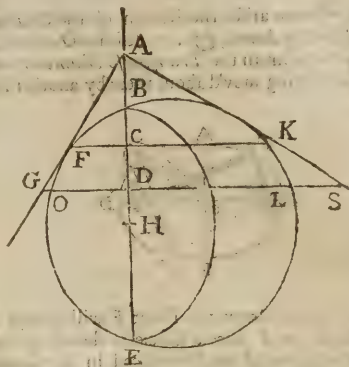
The Ellipse is a mean Proportional between the greater and lesser Circle; For a Circle, or any similar Figure on ab : will be to one of the same Kind on de : As ab : To a third Proportional; i.e. As the Ellipse: Is to the greater Circle :: So is the lesser Circle: To it, viz. as ab to de .

The Investigation of the Tangent to the Ellipse.

Let $BE = q$, $BC = x$, $EC = y$, $CD = n$,
 $AC = t$.

BE the Transverse Ax, H the Center, FA the
 Tangent, FC , OD Ordinates.

CD is supposed indefinitely small.



$$AC^2 : FC^2 :: AD^2 : GD^2,$$

$$\text{But } GD^2 = OD^2,$$

$$\text{Wherefore } AC^2 : FC^2 :: AD^2 : OD^2.$$

$$\text{But } FC^2 : OD^2 :: EC \times BC : ED \times BD,$$

$$\text{Therefore } AC^2 : AD^2 :: EC \times BC : ED \times BD,$$

$$\parallel : CH :: \parallel \parallel$$

By Similar Triangles,
 Because CD is indefinitely small.

By the Curve's Property.
 By Equality of Proportion.

$$t^2 : t^2 + 2tn + n^2 :: qx - nx : qx - x^2$$

$$\text{Wherefore } t^2 qn - 2nxt^2 - n^2 t^2 = 2tnqx$$

$$\text{Therefore } t^2 q - 2xt^2 - nt^2 = 2tqx - 2tx^2$$

$$\text{And consequently } t^2 q - 2xt^2 = 2tqx - 2tx^2$$

$$\text{Wherefore } tq - 2xt = 2qx - 2x^2$$

$$\text{And therefore } t = \frac{2qx - 2x^2}{q - 2x}. \quad Q. E. I.$$

The last Step in Symbols.

By forming an Equation, and casting off the Terms
 common on both Sides.

By dividing all by n .

Casting off n , or putting $n = 0$.

By dividing all by t .

By dividing by $q - 2x$.

PROPOSITION. I.

$$\text{I say, } AC : CE :: AC : CH.$$

$$t : 2q - 2x :: x : q - 2x$$

$$\text{Wherefore } t : q - x :: x : \frac{q}{2} - x$$

$$\parallel AC : CE :: BC : CH. \quad Q. E. I.$$

By the last Equation resolv'd into an Analogy.
 By dividing the second and fourth Term by 2.

PROPOSITION II.

I say, $HC : HB :: HB : HA$ $\frac{1}{2} \text{ of } x : q :: q : x$ Wherefore $\frac{q}{2} - x : x :: q - x : \frac{2qx - 2xx}{q - 2x}$ And therefore $\frac{q}{2} - x : \frac{q}{2} - x + x ::$ $q - x : q - x + \frac{2qx - 2xx}{q - 2x}$ That is, $\frac{q}{2} - x : \frac{q}{2} :: q - x : \frac{q^2 - qx}{q - 2x}$ Or, $\frac{q}{2} - x : \frac{q}{2} :: q - x : \frac{q^2}{q - 2x} - \frac{qx}{q - 2x}$ But $q - x : q - x + x :: \frac{q^2}{q - 2x} - \frac{qx}{q - 2x}$ $\frac{q^2}{q - 2x} - \frac{qx}{q - 2x} + \frac{qx}{q - 2x}$ That is, $q - x : q :: \frac{q^2}{q - 2x} - \frac{qx}{q - 2x}$ $\frac{q^2}{q - 2x}$ But $q - x : \frac{q^2 - qx}{q - 2x} :: \frac{q}{2} - x : \frac{q}{2}$ Wherefore $\frac{q}{2} - x : \frac{q}{2} :: q : \frac{q^2}{q - 2x}$ And consequently, $\frac{q}{2} - x : \frac{q}{2} :: \frac{q}{2} : \frac{q^2}{2q - 4x}$ $HC : HB :: HB : HA$

By the last Step of the last Proposition.

By Substituting the Value of t .

By Compounding.

By casting off Contradictories.

By expressing the last Term in two Parts.

By compounding the two last Terms.

Casting off Contradictories.

By a Step before.

By Equality of Proposition.

By Dividing the two last Terms by 2.

Sir *Is. Newton Prop. XI. Prob. 6. of Princip. Philosoph. Mathemat.* demonstrates, That if any Body revolve round another in an Ellipsis, the Centripetal Force or Gravity of it will be in a Duplicate Ratio, or as the Square of its Distance from the *Umbilicus* or *Focus*.

ELMINTHES, or *Helminthes*, are little Worms bred in the Guts; especially that called *Rectum*, or the Lowermost, the Strait or Great Gut.

ELODES, or *Helodes*, a sort of Fever accompanied with a violent and perpetual Sweating.

ELONGATION, in Astronomy, signifies the Removal of a Planet to the furthest Distance it can be from the Sun, as it appears to an Eye placed on the Earth; but this is most commonly taken notice of in *Venus* and *Mercury*.

The utmost Elongation of *Venus* can be but 45 Degrees, and that of *Mercury* but of 30 Degrees; which is the Reason this Planet is so rarely seen.

ELONGATION, in Chirurgery, is an imperfect Luxation; occasioned by the stretching or lengthening of the Ligaments of any Joint. *Blanchard*.

ELOPEMENT, is when a married Woman departs from her Husband and dwells with an Adulterer; for which, without voluntary Reconciliation to the Husband, she shall lose her *Dowry*; nor shall

the Husband in such case be compelled to allow her any *Alimony*.

ELYTHROIDES, or *Vaginalis*, is a second proper Tunick which immediately involves the *Testes*.

EMANCIPATION, a Term in the *Roman Law*, signifying the setting free of a Son from the Subjection of his Father; which was so hard by the *Roman Law*, that (they say) before a Son could be released from such Subjection, he should be sold (imaginarily) three times by his natural Father to another Man; and this Person the Lawyers called *Pater Fiduciarius*; a Father in Trust; after this he was to be bought again by the natural Father, and then on his manumitting of him he became Free. Now they called this imaginary Sale *Mancipatio*, and consequently, the setting of any Person free from it, *Emancipatio*. *Blount*.

EMBATTELED, or *Crenelle*, a Term in Heraldry, when the Out-line of any *Ordinary* is of this Figure,



which represents the Battlements of a Wall or Castle.

EMBLEMES (in Law) are the Profits of Lands which have been sowed; but sometimes it is taken more largely, for any Profits that arise and grow naturally from the Ground, as Grains, Fruit, Hemp, &c. If the Tenant for Life sow the Land, and afterwards die, the Executor of the Tenant for Life shall have the *Emblements*, and not he in Reversion: But if a Tenant for Years sow the Lands, and before he hath reaped his Term expires, there the Lessor, or he in Reversion, shall have the *Emblements*.

EMBOLISM, is the Excess of the *Solar Year* above the *Lunar*, whereby the *Lunations* happen every subsequent Year, eleven Days sooner than in the foregoing; which, when they amount to thirty Days, make a new Month, called the *Embolisimical Lunation* or *Embolisimical Month*; which must be added, to make the common *Lunar Year* equal to the *Solar*.

EMBOLUS, is the Sucker of a Pump or Syringe; which, when the Pipe of the Syringe is close stopp'd, can't be drawn up, but with the greatest Difficulty; and when forced-up by main Strength, will, on being let go, return again with great Violence.

The *Aristotelians* attribute this Effect to the common Notion of Nature's Abhorrence of a *Vacuum*. But Mr. Boyle found, that in his exhausted Receiver the Sucker would be as easily drawn up, tho' the Orifice of the Pipe were close stopp'd, as it would be when open in the common Air. From whence it seems plain, that the Difficulty of drawing back this *Embolus* or Sucker, when the End of the Syringe is stopp'd, arises from the Pressure of the Atmosphere on the external End of the Sucker; which having at the other End no *Counter-pressure*, nor Spring of the Air to balance it, must press with all its Weight and keep down the Sucker; but when by pumping the Air out of the Receiver, this Pressure, or its equivalent Spring of the Air is taken away, there is nothing to keep down the Sucker, and so it may be easily drawn up. He found also, That when the Sucker could in *vacuo* thus easily be drawn back, yet on the Re-admission of the Air it would be forc'd in again, and raise along with it a considerable Weight, which was suspended at the external End of the Sucker. *Vid. Continuation of Physico-Mechan. Exp. Part 1.*

EMBRACEUR, or *Embrasour*, (in Law) is he that when a Matter is in Trial between Party and Party, comes to the Bar with one of the Parties (having received some Reward so to do) and speaks in the Cause; or privily labours the Jury, or stands there to over-look and survey them, thereby to put them in Fears and Doubt of the Matter, the Penalty whereof is 20 *L.* and Imprisonment at the Justice's Discretion. But Persons learned in the Law may speak in the Cause of their Clients.

EMBRASURE, in Architecture, is the Enlargement made in the Walls, to give more Light and greater Convenience to the Windows and Doors of a Building.

EMBRASURES, in Fortification, are the Holes in a Parapet, through which the Cannons are pointed to Fire into the Moat or Field: They are generally 12 Foot distance from one another; every one of them being from 6 to 7 Foot wide without, and about 3 within; their Height above the Platform is 3 Foot on that Side toward the Town, and

a Foot and a half on the other Side toward the Field, that so the Muzzle may be sunk on occasion, and the Piece brought to shoot low.

EMBROCCATION, (from *ἐμβροχῶ*), *Irrigation*, or *Wetting* is a kind of Fomentation, wherein the fomenting Liquor is let distil, drop by drop, or very slowly, upon the Part of the Body to be fomented.

EMBRYO, is the *Fetus* in the Womb of the Mother, before its Members come to be distinctly form'd.

EMBRYOTHLASTES, an Instrument with which Chirurgeons break the Bones of a dead Child, that it may be the more easily taken out of the Womb.

EMBRYOTOMY, the Anatomical Dissection of an *Embryo* or *Fetus*.

EMBRYULCUS, an Iron Hook with which Chirurgeons pull a dead *Fetus* out of the Mother's Womb.

EMERGENT, the same with *Emerison*.

EMERSON, in Astronomy, is the Time when any Planet that is eclipsed begins to *emerge* or get out of the Shadow of the eclipsing Body. When any Body also, lighter in Specie than Water, being thrust violently down into it, rises again, 'tis said to *emerge* out of the Water; and this is the most proper Signification of the Word.

EMETICK, or *Vomitive Medicines*, are those which with their pungent Particles contract the Fibres of the Stomach upwards, and so eject at the Mouth whatsoever is offensive to the Stomach, as is the commonly received Notion. But Dr. Purcell, in his Book of *Vapours*, p. 39 supposes that Vomiting is caused by Salts, which prick and corrode the Nerves of the Stomach, from whence the Spirits flow to the Brain in great quantity; and either by the Proximity of the Origin of those Nerves, or by the Angle of Incidence, they are forced into the Nerves belonging to the Diaphragm, and the Muscles of the lower Belly; both which contracting themselves, squeeze the Stomach into a less compass, and so make it eject its Contents: and though some part of the Matter may go downwards by the *Pylorus*, yet the far greater Quantity must go upwards, because when the Diaphragm is contracted, it forces down the Liver, and makes it compress the *Pylorus*, and hinder any Thing from passing out that way; and this Account he confirms by the Experiments of Dr. Chirac, an eminent Anatomist at *Montpellier* in France, and of his own made upon Dogs, above twenty times; And how he solves the Difficulty of the Muscles of the Diaphragm, and of the Abdomen contracting themselves both at the same time, when they are really Antagonists to one another, you will see in his Book, p. 43.

EMETICK Tartar, is only Cream or Crystal of Tartar powder'd and mix'd with a quarter part of *Crocus Metallorum*, and then the Mixture is boiled in an earthen Pan in a sufficient Quantity of Water, for about 8 or 9 Hours: It must be stirred about continually, and new Water put in as the Former boils away. The hot Liquor at last is strained through a woollen Cloth, and then about half of it is gently evaporated; the rest is set to cool; and it will shoot into Crystals. 'Tis a fine, gentle, yet certain Vomitive. The Dose from 3 or 4 Grains to 10 or 12.

EMMENAGOGUES, are Medicines which excite the Menstrues.

EMMOTON, is a Liquid Medicine which is injected into Ulcers.

EMOLLIENTIA, softning Things, are such as with a moderate Heat and Moisture dissolve those Parts which before cohered close; and dissipating others, make them loose and soft.

EMPA-

EMPALEMENT, according to our Learned Dr. Grew, is the outmost Part of the Flower of a Plant encompassing the Foliation of the Attire: 'Tis compounded of the three general Parts of all Plants, the Skin, the Cortical, and the Ligneous Bodies, each Empaler being (whether consisting of one or more Pieces) as another Leaf, and is designed to be a Guard and a Band to the Flower where it is weak and tender; and therefore such Plants as have Flow-ers with a firm and strong Basis, as Tulips, &c. have no Empalement, nor need any.

EMPANEL, in Law, signifies the Writing and Entering the Names of a Jury into a Parchment Schedule or Roll of Paper by the Sheriff, which he hath summon'd to appear for the Performance of such public Service as Juries are employ'd in.

EMPARLANCE, in Common Law, signifies a Desire or Petition in Court of a Day, to pause what is best to do: And 'tis called by the Civilians *Petitionem induciarum*.

EMPASMA, the same with *Catapasma*.

EMPATTEMENT, according to some, is the same with *Talus* in Fortification; which see.

EMPERICKS, are the same with Mountebanks, or bold ignorant Pretenders to the Practice of Physick. However *Empirical* Medicines, as some are pleased to call the very best in Use, are by no Means totally to be slighted, nor that Practice of this Art, which is built on Experience, to be condemn'd; but only the daring Attempts of such ignorant Pretenders as are no way qualify'd to judge of the Symptoms of a Disease, nor the peculiar Circumstances of their Patient's Temper and State of Body.

EMPHATICAL, is used in two Senses; when any thing is spoken with great Earnestness and Emotion of Mind, we say, 'twas spoken very *Emphatically*, or with a great *Emphasis*. 'Tis also used by the old Natural Philosophers for those *Apparent Colours* (as they would call them) which are often seen in Clouds before the Rising, or after the Setting of the Sun, or those in the Rain-bow, &c.

And these, because they are not permanent or lasting, they will not allow to be true Colours: But since these *Emphatical Colours* are Light, modified chiefly by Refraction, and with a Concurrence of Reflections, and some other accidental Variations; and being the proper Objects of Sight, and capable as truly to affect it as other permanent Colours are, there is no reason for excluding them from the Number of true and genuine Colours, since all other Colours are only Modifications of Light as these are.

EMPHRACTICK, the same with *Emplattomena*, or *Emplasticks*.

EMPHRAXIS, is an Obstruction in any Part.

EMPHYSEMA, is an Inflammation or a windy Swelling or Blowing up any Part of the Body. *Blanchard*.

EMPHYTON *Thermon*, or *Calor Innatus*, is the innate Heat, or Heat first supposed to be produc'd in the Fœtus from the Parent's Semen, which afterwards, when Respiration is begun, and the Fœtus subsists of it self, decays forsooth, by Degrees. Many Philosophers and Physicians call this Heat an *innate or native Spirit*, and say that it consists of three Parts, of a *primogenial Moisture*, an *innate Spirit*, and Heat. Whence Fernelius defines *innate Heat* to be a *primogenial Moisture every way qualified with an innate Spirit and Heat*. *Blanchard*.

EMPIRICAL Medicine, now-a-days called *Quackery*, is a practising Physick, without enquiring either into the Nature of the Disease, or of the Medicines employed to cure them; but depending sole-

ly on the Authority of experienced Medicines, which are usually apply'd too universally, in all Cases and Circumstances alike. *Acron Agrigenius* was the first Author of it, who neglecting the Reasons of Things, contented himself with bare Experience.

Quacks first flourished amongst the *Egyptians*; from this Trade came *Mountebanks*; and those that now practice Physick after this bold and heedless rate, are called *Empericks*.

EMPLASTRUM, a Plaster, is a Medicine applied outwardly to the Skin, spread upon Linnen or Leather: It is commonly made of Oils, or of those Things which are of a like Consistence with Oil; as Swine's-grease, Butter, slimy, viscous Extractions from Gums, Roots, &c. Also of Powder and Wax, are these Things which are of a like Consistence with Wax, as Rosin, Pitch, Gum, &c. The Mass whereof being yet hot, is formed into a *Cylindrical Figure*. *Blanchard*.

EMPLASTICKS, } are Salves which so
EMPLATTOMENA, } conspire and shut up
the Pores of the Body, that Sulphurous Vapours cannot pass. *Blanchard*.

EMPNEUMATOSIS, is an alternate Dilatation of the Thorax, whereby the external Air is continually breathed in, and by the Wind-pipe and the Lungs, is communicated to the Blood to accend it. *Blanchard*.

EMPORIUM, is often used for the *common Sensory* in the Brain.

EMPROSTHOTONUS, is a continual Contraction of the Muscles of the Neck towards the Foreparts. *Blanchard*.

EMPYEMA, properly so called, is a Collection of purulent Matter in the Cavity of the *Thorax*; but largely taken, signifies the same in the *Abdomen* too. *Blanchard*.

EMPYREUMATA, are little Feverish Remains after a *Crisis*; also that thick viscous Matter which subsides to the Bottom in distilled Waters. *Empyreuma* signifies also that Taste and Smell of the Fire which in Distillations affects some Oils, Spirits and Waters, by reason of their being drawn off by too great a Degree of Heat.

EMRODS: See *Hamorrhoids*.

EMULGENT Vessels, are the two large Arteries and Veins which spring, the Former from the descending Trunk of the *Aorta* or great Artery, the Latter from the *Vena Cava*. They are both inserted into the Kidneys, and the *Emulgent Arteries* carry the Blood (with the *Serum*) to them, and the *Emulgent Veins* bring it back again after the *Serum* is separated from it by the Kidneys.

EMULSION, is a Liquid Medicine to be taken inwardly, of the Form and Colour of Milk, whence comes its Name (*Quasi Lamentiens*.)

EMUNCTORIES, are the Cavities into which the Excrements of an Animal Body are emptied, as the pituitous Humour of the Brain, into the Nostrils; the yellow thickish Humour, which we call Ear-wax, into the Ears; the Excrements, into the Bowels; the Urine, into the Bladder, &c.

ENEMON, is a Medicine which stops the Blood, or which, by binding, cooling or drying, closes the Passages of the Vessels which were open; stops or diminishes the Fluidity and violent Motion of the Blood. *Blanchard*.

ENÆOREMA, is that Crass Substance which is suspended in the Middle of the Urines, call'd the *Hypostasis Urine*. *Blanchard*.

ENALLAGE, a Figure in Grammar, whereby there is a Change either of a Pronoun, as when a Possessive is put for a Relative, as *Suus* for *Ejus*; or

of a Verb, when one *Mood* or *Tense* is put for another, *Ecce*.

ENALURON, the Term in Heraldry for a Bordure charged with *Martlets*, or any Kind of Birds: Thus they say, he beareth *Argent*, a *Bordure Azure*, charged with an *Enaluron* of *Martlets*; meaning, that there are *Martlets* all round the *Bordure*.

ENARTHROSIS, is (in Anatomy) a kind of Jointing, when the Cavity that receives it is deep, and the Head of the Bone that is inserted is oblong, as may be seen in the Huckle-bone and its Cavity; in the principal Bone of that Part of the Foot which immediately succeeds the Leg, with the Bone call'd *Cymbiforme*.

ENCATHIS, or *Encathis*, is the *Caruncula Lacrymalis*; which see.

ENCAUMA, or *Epicauma*, is a deep, hard, and crusty Ulcer of the Eye. *Blanchard*.

ENCIENT a *French* Term, in Fortification, signifying the whole Enclosure, Circumference, or Compass of a Fortified Place, whether composed of Bastions or not.

ENCEPHALOS, is whatsoever is within the Compass of the Skull, as the Brain, the *Cerebellum*, the *Medulla Oblongata*, &c.

ENCHARAXIS: See *Scarificatio*.

ENCHEIRESIS Anatomica, is a Readiness in Dissections, when an Anatomist shews the Parts of a Body dexterously and expeditiously.

ENGHYMONA, is an Afflux of the Blood, whereby the external Parts are render'd black and blue; as in the Scurvy, Blood-hot Eyes, &c. Also an Afflux of the Blood by the Quickness and Suddenness of its Motion, as in Anger and Joy. *Blanchard*.

ENCHYTA, or *Infundibulum*, is an Instrument wherewith Liquids are infilled into the Eyes, Nostrils and Ears.

ENCHYSMA, the same with *Clyster*.

ENCOPE, is an Incision of any Part, as in a Gangrene, &c.

ENCRANIUM, the same with *Cerebellum*.

ENCROACHMENT, or *Accroachment*, in Common Law, signifies an unlawful gaining upon the Right or Possessions of another.

END for End: When a Cable, Hawser or other Rope of a Ship is run clear off from the Block or Place it was wound about, they say at Sea, *'Tis run out End for End*.

ENDECAGON; a plain Figure in Geometry, of eleven Sides and Angles.

ENDEIXIS, is an Indication of Diseases, whereby is shewn what is to be done: As for Example, a *Plethora*, or too great Fullness of Blood, indicates the opening of a Vein. *Blanchard*.

ENDEMICAL, *Endemial*, or *Endemious Disease*, is that some call *Morbus Vernaculus*, *Ecce Communis*; that is, a Disease which always infects a great many in the same Countrey, proceeding from some Cause peculiar to the Countrey where it reigns: Such is the Scurvy to the *Hollanders*; intermitting Fevers to the Inhabitants of our Submarine and Marshy Places, &c.

ENDITEMENT, or *Indictment*, in Common Law, is the same with *Accusatio* in the Civil Law, tho' in some Points it differs. It may be thus defined: An *Indictment* is a Bill or Declaration made in Form of Law (for the Benefit of the Commonwealth) exhibited as an Accusation of one for some Offence, either Criminal or Penal, unto Jurors, and by their Verdict found and presented to be true, before an Officer, having Power to punish the same Offence. It is always at the Suit of the King, and differs from an Accusation in this, that the *Preferer*

is no way tied to the Proof thereof, upon any Penalty, if it be not proved, except there appear Conspiracy.

ENDORSE, a Term in Heraldry, signifying the $\frac{1}{2}$ Part of a *Pale*; and some say it is not used but when the *Pale* is between two of them; but this *Guilim* finds fault with as too bold a Saying.

He beareth *Or*, an *Endorse* Gules.

ENDORSED, when two Lions are born rampant, and turning their Backs to each other, the Heralds say they are *Endorsed*; but if their Faces be towards each other, they call it *Combatant*.

ENDOWMENT, signifies the giving or assuming of a Dower to a Woman; also the setting or severing of a sufficient Portion for a Vicar towards his perpetual Maintenance when the Benefice is appropriated; and such a Vicarage is called a *Vicarage Endow'd*.

ENDOWMENT de la plus belle part, is where a Man dying, seized of some Landsholden in Knight's Service, and other some in Socage, the Widow is sped of her Dower, rather in the Socage Lands, than those holden in Knight's Service, as being *le plus belle part*, the fairer Part.

ENEMA, the same with *Clyster*.

ENERGETICAL Bodies or Particles, are such as are eminently active, and which produce manifest Operations of various Natures, according to the various Circumstances and Motions of such Bodies or Particles.

ENERGY, in a Medicinal Sense, is an Agitation or Operation of the Animal Spirits and Blood.

ENFANS Perdans, the same with *Forlorn Hope* in an Army; which see.

ENFILE, in Fortification, signifies a Situation of Ground which discovers a Post according to the whole Length of a Right Line, so that it can be scoured with the Cannon, and rendred almost Defenceless: Wherefore to

ENFILE or *Enfilade* the Curtain or Rampart, is to sweep the whole Length of it with the Cannon.

ENFRANCHISE, to make Free, to incorporate a Man into a Society or Body-politick, or to make one a Free *Denizon*.

ENGINE, in the general, is any Mechanick Instrument composed of Wheels, Screws of Pulleys, in order to lift, cast, or sustain any Weight, or to produce any considerable Effect which cannot so easily be obtained by the bare Application of Men's Hands without such help; such as Warlike *Engines*, *Engines* to raise Water, Cranes, &c.

And here I think it proper to give the Reader a Description of two very useful *Engines*, which are the Invention of one of our own Nation, *Thomas Savery*, Esq; a Gentleman very skilful in all Things of this Nature, and now Treasurer to the Sick and Wounded Office.

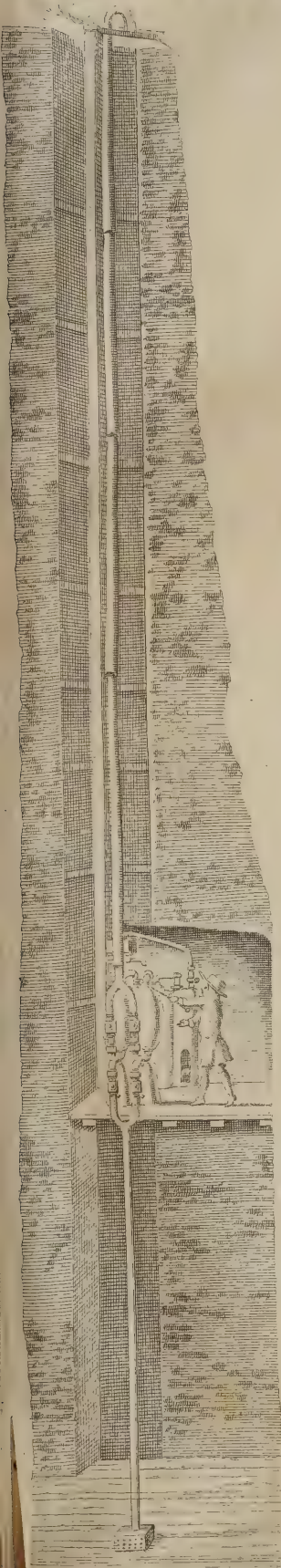
The First is an *Engine* to row Ships and Boats at Sea, or in a River, when there is a stark Calm or very little Wind.

A Description of this the Inventor published in the Year 1698, with his Answers to the Objections raised against it by Mr. *Dummer*, and others: And the Thought is so natural, and the Manner of its working so plain and easy, that 'tis an amazing thing to one that there is no more use made of it.

He fits a Wheel to the Drum-head of the Captain, whose Teeth turn a Trundle-head; through which is run an Iron Bar that reaches clear across, and goes through the Sides of the Ship; and on its Ends, without Board, at a convenient Distance from the Ship's

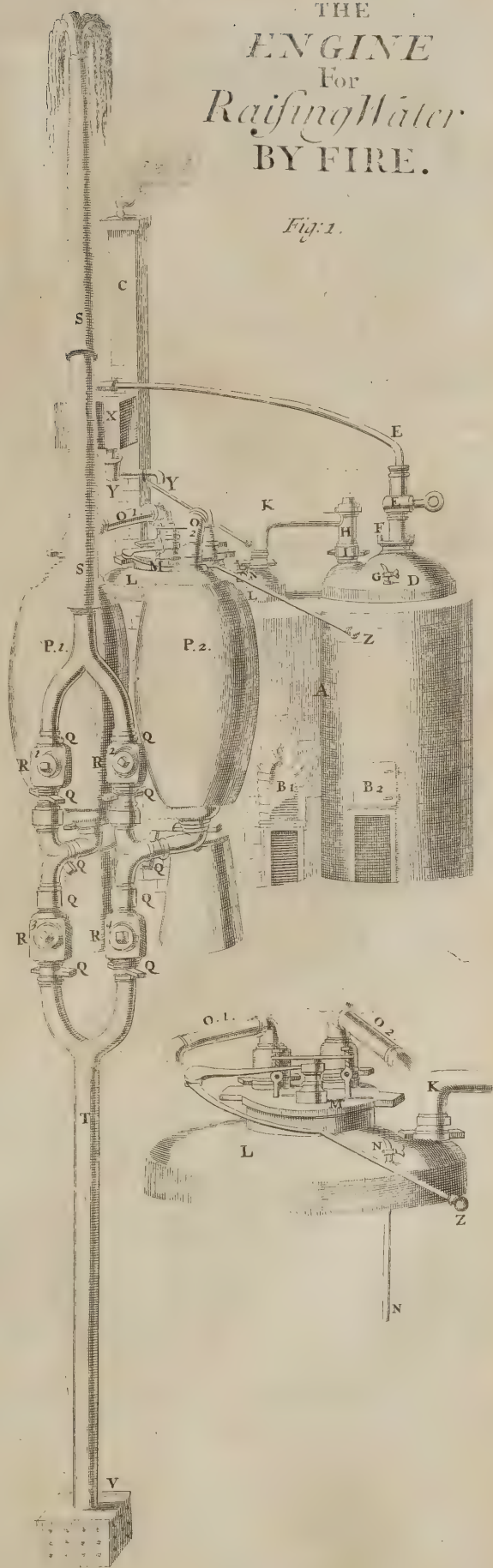


Fig: 2.



THE
ENGINE
For
Raising Water
BY FIRE.

Fig: 1.



The
ENGINE
Working in a
MINE. Place this at the word Engine

B. Lens delin: I. Sturt sculp:

Ship's Sides, are fastened two Drum-heads like that on the Capstan, in which are fitted, to take out at pleasure, 6 or 8 Paddles; and at the outermost Ends of the Paddles is fastened an Iron Pin with an Head to it; by which Means, and by the help of a Cord, taking an half turn round about all these Pins, both the Paddles may be *swifted* or strain'd, and strengthened so, that they shall all work proportionably; and also the Paddles may with a Luff Tackle be the more handily and easily lifted in and out, in order to be fitted into or taken out of the Drum-heads of the Bar: See the Figure annexed.

Now here if the Men will but work, if there be enough of them, and the Paddles be made proportionably large, according to the number of the Men that can be brought to work at the Capstan; I cannot see but that the *Engine* will give the Vessel fresher Way than any Oars can do, work'd by the same, or a far greater number of Hands, as the Experiments that have been tried do abundantly shew, according to the best Information I can get of the Matter.

The other *Engine* is for raising Water by the Force of Fire, in which he hath shewed as great Ingenuity, Depth of Thought, and true Mechanick Skill, as ever discovered it self in any Design of this Nature.

The Description of this Engine is as follows.
See the Figure.

A denotes two Furnaces, whose Fire-places are *B*, 1; 2, and their Funnel or Chimney *C*.

In these two Furnaces are placed two Vessels of Copper, which he calls *Boylers*, the one a larger, as *L*, the other a smaller, as *D*.

These *Boylers* have each a *Gage Pipe*, as *G* and *N*, of which *G* goes within eight Inches of the Bottom, but *N* reaches only half way down the great *Boyle*.

By these Pipes, before the *Engine* can work, you must first fill the small *Boyle* quite full, and the great *Boyle* two Thirds full of Water: Then light the Fire at *B* 1, and make the Water in *L* boil, by which Means the Steam of it being quite confined, must needs be wonderfully compressed, and therefore will, on the opening of a Way for it to issue out (which is done by turning *Z* the Handle of the Regulator from you) rush with a great Force thro' the *Steam Pipe* *O*, 1, into the Receiver *P* 1, driving all the Air before it, and forcing it up into the Force-Pipe through the Clack *R*, 1, as you will perceive by the Noise and Ratling of the Clack. And when all the Air is thus driven out, the Receiver *P*, 1, will be very much heated by the Steam: When you find that it is thoroughly emptied, and is grown very hot, as you may both see and feel, then pull the Handle of the Regulator towards you, by which Means you will stop the *Steam-Pipe* *O*, 1, so that no more Steam can yet come into it, but you will open it a Way into *O*, 2, and by that Means fill the Receiver *P*, 2, with the Steam, as the other was before. While this is doing, let some cold Water be poured on the Receiver *P*, 1, by which Means the Steam there being cooled, and condensed, and contracted into a very little Room, and consequently pressing but very little (if at all) on the Valve or Clack *R*, 1, at the Bottom of the Receiver, *P*, 1. There is nothing there to counterbalance the Pressure of the Atmosphere on the Surface of the Water in the lower Part of

the Sucking-Pipe *T*; wherefore it will be pressed up, and ascend into, and fill the Receiver *P*, 1, driving up before it, as it rises, the Clack or Valve *R*, 2, which afterwards falling down again and shutting close, hinders the Descent of the Water that Way.

Then (the Receiver *P*, 2, being in the mean time emptied of its Air) turn the Handle of the Regulator from you, and the Force of the Steam coming from the *Boyle*, will be all upon the Surface of the Water contained in the Receiver *P*, 1, where it gravitates or presses hard upon it, and still increases its Spring or Elasticity till it comes to over-balance, or exceed the Weight of the Water in the Receiver, which then it will necessarily drive up through the Passage *Q*, *R*, 1, *Q*, *Q*, into the Force-pipe *S*, and at last discharge it out at the Top, as you see in the Figure.

After the very same Manner, tho' alternately, is the Receiver *P*, 2, filled with and emptied of Water; and by this Means a constant Steam is kept continually running out at the Top of the Force-pipe *S*, and so the Water is raised very easily from the Bottom of the Mine, &c. to the Place where it is designed to be discharged.

Only I should add, That after the *Engine* begins to work, and the Water is risen into and hath filled the Force-Pipe *S*, then it fills the little Cistern *X*, and by that Means feeds the Pipe *Y*, which he calls the *Condensing-Pipe*, because Water is conveyed down from thence to cool the Receivers when thoroughly heated by the Steam, in order to make them *Suck* (as 'tis usually called) the Water out of the Well up into the Receiver.

Also a little above that Cistern goes the Pipe *E*, which conveys Water from the Force-pipe into *D* the lesser *Boyle*, which is there placed to replenish the greater *Boyle* *L* when the Water in it begins to be almost consumed. Now when there is need of doing this, turn the Cock *E* so, that there can be no Communication between the Force-pipe *S*, and the lesser *Boyle* *D*; and putting in a little Fire at *B*, 2, the Water there will grow presently hot; and when it boils, its own Steam, which hath no vent out, pressing on its Surface, will force the Water up the Pipe *H*, through *K*, into the great *Boyle* *L*, and so long will it run till the Surface of the Water in the *Boyle* *D*, get to be as low as the Bottom of the Pipe *H*; and then the Steam and Water will run together, and by its Noise and rattling of the Clack *I*, will give him that works the *Engine* sufficient Assurance that *D* hath emptied and discharged it self into *L*, and carried in as much Water as is then necessary; after which, by turning the Cock *I* again, you may let new cold Water out of *S* into *D* the lesser *Boyle*, as before: And thus will there be a constant Motion, and a continual Supply of the *Engine* without fear of Decay or Disorder.

Also to know whether *L* want replenishing or not, you need only turn the Cock *N*, and if Water come out, there is no need to replenish; but if Steam only come, you may conclude there is: And the like will the Cock *G* do in reference to the lesser *Boyle* *D*, shewing when 'tis necessary to supply that with fresh Water from *S*; so that in working the *Engine* there is very little Skill or Labour required, it being only to be injured by either a stupid or wilful Neglect.

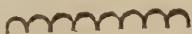
Of the Uses and Application of this *Engine*, the Reader will find a full Account in the Inventor's Book called the *Miner's Friend*.

ENGIZOMA, is a Blow upon the Skull, where- with the Bone descends to the inner Membrane of the Brain, and presses upon it. Also an Instrument in such like Cases. *Blanchard.*

ENGONASIS *Hercules*, the Name given by Astronomers to one of the Northern Constellations, containing about 48 Stars.

ENGONIOS, is the bending of the Arm or Leg.

ENGRAILED, a Term in Heraldry, when a Bordure, &c. is formed by a Line of this Shape;



and the little Arches turn outward from the Center of the Escutcheon; for if they turn the other way, 'tis called *inverted*.

ENGYSCOPE, the same with a *Microscope*, being an Instrument to view small Bodies distinctly; and 'tis so called, because it brings the Eye much nearer to these small Bodies, and consequently makes them appear to us to have larger Parts and Dimensions than they had before: See *Microscope*.

ENHARMONICAL, } a Term in Musick, u-
ENHARMONICK, } sually applied to the last of the three kinds of Musick, abounding in *Diesis*, which are the least sensible Division of a Tone: See *Diesis*.

ENIGMA, or *Riddle*, is an obscure Allegory, where the Natural Sense of the Words are not presently perceptible, being, in Appearance, frequently Contradictory.

ENIXUM-SAL, is the Chymical Term for what they otherwise call a *Neutral Salt*, which participates both of the Nature of an *Acid* and an *Alkali*; as *Common Salt*, *Nitre*, *Alum*, *Vitriol*, &c.

ENNEADECATERIDES, the same with the *Golden-Number*; which see; or the *Cycle of the Moon*.

ENNEAGON, is a Polygon of Nine equal Sides.

ENNEATICAL Days, signifies every ninth Day of a Sickness, which some will suppose doth bring some great Alteration in the Disease.

ENNEATICAL Years, are every ninth Year of ones Life, which, by some weak Men, are thought to bring a great Mutation of Fortune along with them.

ENNEEMIMERIS, is one kind of the *Cesura* of a *Latin Verse*, where, after the fourth Foot, there is an odd Syllable ending a Word, which helps to make the next Foot with the following Word; as in this Instance,

Ille latus Niveum Mollis fultus Hyacintho.

Where all the four kinds of the *Cesura* occur.

ENORTHROSIS: See *Diarthrosis*.

ENQUEST, is taken for an Inquisition by a Jury, which is the most usual Trial in all Causes both Civil and Criminal within this Realm; for in Causes Civil, after Proof is made on either Side of so much as each Party thinketh good for himself; if the Doubt be in the Fact, it is refer'd to the Discretion of twelve indifferent Men, empanell'd by the Sheriff for that Purpose; and as they bring in their Verdict, so Judgment passeth; for the Judge saith, The Jury findeth the Fact thus, and the Law is thus. For the *Enquest* in Criminal Causes, see *Fury*.

ENS, or *Being*, is whatever hath any kind of Being or Existence; for that which hath no Existence nor Essence, is really nothing at all. This the Schools, (who make a great Variety of Beings) call *Ens Reale*, and *Ens Positivum*, to distinguish it from their *Ens Rationis*, which is only an imaginary thing, a Creature of the Brain, and exists nowhere but in the Understanding.

ENS PRIMUM, according to the Cant of *Paracelsus*, is the most Efficacious Part of any natural mixt Body, Vegetable, Animal, or Mineral, which he pretends to have been able to separate from them, and with it to effect prodigious things towards the Renovation and Restoration of Youth: And though he delivers his Processes so obscurely, as to encourage no Body to try them; yet Mr. Boyle gives us a Process of Mr. L. F. Chymist to the French King, whereby the *Ens Primum*, or Essence of any Vegetable, may easily be obtained, as he had tried himself, and is as follows.

Gather, at a convenient Season of the Year, and Time of the Day, *Balm*, for Instance, or some other fitting Herb (for all Plants cannot this way be turned into Water) beat it to a soft Mass or Pulp in a Marble Mortar, and then putting it into a Bolt-head hermetically sealed, digest it for 40 Days in a Dughil, or some Analogous Heat: After this take out the Matter, which will now be much more liquid than before, and separating from it the Dregs or grosser Parts, digest it anew in a gentle Bath, that the remaining grosser Parts also may subside; filtrate it, and then add to it the fix'd Salt drawn from the former Dregs dried and calcined. To this prepared Liquor add equal Parts of the Liquor of good Sea Salt, well purified, melted, and then let it run *per Deliquium*. Seal up then the Mixture in a Bolt-head, and let it be exposed to the Sun for six Weeks longer; at the End of which Term there will swim upon the Liquor the *Ens Primum* of the Plant in a liquid transparent Form, sometimes of a Green, and sometimes of a Reddish Colour, according to the Nature of the Plant thus managed.

Mr. Boyle says, That Mr. L. F. assured him once in the presence of another Virtuoso, to whom he appealed for the Truth of the Fact, as having been made acquainted with the Operation, That a special Friend of his thus drawing the Essence of Balm, tried it upon himself for about a Fortnight, taking it according to *Paracelsus* his Description; before the End of which Time the Nails of his Hands and Feet came off without pain, being succeeded by a Set of new ones; and convinced him so far of the Efficacy of it, that he having no need of any such help, left off taking it; and tried it no farther; but that giving it to an old Woman of 70 Years of Age, who served in the House, it produced the *Menses* again, and that so copiously, as wonderfully to startle the old Woman.

Nay, he told Mr. Boyle farther, on his enquiring why he did not try it on Beasts, That he gave of it, tho' but in a little quantity, as having not much of it left, to an old Hen, who on the sixth Day began to moult her Feathers till she grew stark naked; but before a Fortnight was passed, received others in their room, which were fairer and better coloured than the former Feathers.

This is an odd Relation, but however 'tis easy to make Trial of Matter of Fact; and I wonder no one hath attempted all this while to prosecute a thing which is so easy to effect, and whose Success would reward sufficiently the Explorer's Pains and Time, if it will do.

ENS Veneris, is a Sublimation of equal Parts of the Powder of *Cyprus Vitriol*, calcined till 'tis of a dark Colour, and of Salt-Armoniack into the Form of a Yellow Flower; and they are so called from some Particles of Copper which they have carried away from the Vitriol: The Chymists calling Copper *Venus*.

Mr. Boyle commends them as an admirable Medicine in the Rickets, obstinate Cachexies, Loss of Appetite, and all Obstructions. Their Dose is from six Grains to a Scruple.

ENS CONCED: See *Inconced*.

ENSIFORMIS Cartilago, or *Mucronata*, is the lowest Part of the *Sternum*, or the Breast Bone; and because of its pointed triangular Shape, 'tis called *Mucronata* and *Ensiformis*: 'Tis about an Inch long, and on the Out-side of it there is formed a Cavity in the Breast called *Scrobiculus Cordis*, or the Heart-Pit; and a gnawing Pain which is sometimes felt here, is called *Cardialgia*, the Heart-burn: But this Pain proceeds not from the Heart, but from the upper Orifice of the Stomach, which lies under this Cartilage, and hath the Name of *Cardia*, because of its great Consent with the Heart, as some fancied formerly.

ENTABLATURE, or *Entablement*, a Term in Architecture, signifying the *Architrave*, *Frise*, and *Cornice* of a *Pillar*, being, in effect, the Extremity of the Flooring, which is either supported by Pillars, or by a Wall, if there are not Columns.

ENTAYLE, in common Law, signifies *Fee-tail*, or *Fee-intailed*, or *Abrided*.

ENTELECHIA, a Greek Word used by *Aristotle* to express the Human Mind: They tell us, that *Hermolaus Barbarus* went to the Devil to know the Meaning of it; and either the Devil for him, or his own great Understanding, renders it *Perfecti-babia*; by which his Readers are much the wiser.

The Ancient Commentators on *Aristotle* interpret it by the Word *Actus*, and mean by it a kind of *Substantial Form*, by which Action is produced in the Body.

The Modern Peripateticks come nearer to what perhaps was *Aristotle's* Meaning: for they make a kind of Motion and happy Modification of Matter qualifying the Whole, to be able to perform such Acts as are proper to it: And thus *Cicero* in his *Tuscul. Quest.* renders *Entelechia*, *quadam quasi Continuada & perennis Motio*.

ENTERENCHITA, is a Clyster-Pipe, which is also called *Siphon* and *Syringa*.

ENTEROCELE, or *Hernia Intestinalis*, is the fall of the *Intestines*, especially of the *Ilium*, thro' the Processes of the *Peritoneum*, dilated into the Groins, or outward Skin that covers the *Scrotum*. *Blanchard*.

ENTEROEPIPOCELE, a sort of Rupture, in which the Guts and Caul fall down into the *Scrotum* together. *Blanchard*.

ENTEROMPHALUS, or *Hernia Umbilicalis*, a Rupture of the Navel, or the Bunching out of the Guts at the Navel, which is common with Teeming Women.

ENTERPLEDER, in Common Law, signifies as much as *Cognitio prejudicialis* in the Civil; that is, the discussing of a Point incidentally falling out before the principal Cause can take end. For Example, Two several Persons being found Heirs to Land, by two several Offices in one County, the King is brought in doubt to which of them Livery ought to be made, and therefore first they must in-

terplead; that is, formally try between themselves who is the right Heir.

ENTHYMEME, is a Syllogism perfect in the Mind, but imperfect in the Expression; because some one of the Propositions is suppressed, as being too clear and common, and easily supplied by the Understanding of those with whom we discourse: As, *Every Right-lined Triangle hath all its three Angles just equal to two Right ones; therefore it will be so in an Isosceles*; where the Proposition, that an *Isosceles* is a *Right-lined Triangle*, is omitted, as being sufficiently known, and therefore it would have been impertinent to have inserted it.

ENTIRE Tenancy, is contrary to *Several Tenancy*, signifying the sole Possession in one Man, whereas the other signifieth Joint or Common in more.

ENTOYRE, the Term in Heraldry to Blazon a Bordon when it is charged with things without Life, such as *Bezants*, *Plates*, &c.

ENTRING-LADDER, in a Ship, is of two Sorts; one is used by the Ship's Sides in a Harbour, or in fair Weather, for Persons to go in and out of the Ship; the other is made of Ropes with small Staves for Steps, and is hung out of the Gallery to enter into the Boat, or to come Aboard the Ship from thence, when the Sea runs so high, that they dare not bring the Boat to the Ship's Side for fear of *Staving* of her.

ENTRUSION, in Law, signifies a violent or unlawful Entrance into Lands or Tenements, being utterly void of a Possessor, by him that hath no Right unto them.

ENTRUSION de gard, is a Writ that lies where the Infant within Age, entered into his Lands, and held his Lord out; for in this Case the Lord shall not have the Writ *de communi Custodia*, but this.

ENTRY, a Term in Law, signifies properly the taking Possession of Lands or Tenements: 'Tis used also for a Writ of Possession.

And in the Plea of Entry there be three Degrees.

First, Where a Man demandeth Lands or Tenements of his own Seisin, after the Term is expired.

The Second is, Where one demandeth Land or Tenements, lett by another after the Term is expired.

The Third, Where one demandeth Lands or Tenements of that Tenant that had Entry by one to whom some Ancestor of the Plaintiff did lett for a Term now expired; according to which Degrees, the Writs for more fit Remedy are varied.

A Writ of Entry differeth from an *Assise*, because it lieth for the most part against him who entered lawfully, but holdeth against Law; whereas an *Assise* lieth against him that unlawfully disseised: Yet sometimes a Writ of Entry lieth upon an Intrusion.

There are Five Things which put the Writ of Entry out of the Degrees, viz. *Intrusion*, *Succession*, *Disseisin* upon *Disseisin*, *Judgement*, and *Escheat*.

1. *Intrusion*, is when the Disseisor dies seized, and a Stranger abates.

2. *Succession*, is when the Disseisor is a Man of Religion, and dies, or is disposed, and his Successor Enters.

3. *Disseisin upon Disseisin*, is when the Disseisor is disseised by another.

4. *Judgement*, is when one recovers against the Disseisor.

5. *Eſcheat*, is when the Diſſeiſor dies without Heir, or doth Felony, whereby he is Attaint, by which the Lord *Enters*, as in his *Eſcheat*.

ENTRY *ad Communem Legem*, is a Writ which lies where Tenants for Term of Life, Tenant for Term of another's Life, Tenant by the Courtſey, or Tenant in Dower, aliens and dies, he in the Reverſion ſhall have this Writ againſt whomſoever is in.

ENTRY *ad terminum qui prateriit*, lies where a Man Leases Land to another for Term of Years, and the Tenant holds over his Term, the Leſſor ſhall have this Writ.

ENTRY *cauſa Matrimonij prelocuti*, is a Writ which lies where Lands or Tenements are given to a Man upon Condition, That he ſhall take the Donor to his Wife within a certain Time, and he eſpouſes another, or otherwiſe diſables himſelf that he cannot take her according to the ſaid Condition; then the Donor and her Heirs ſhall have the ſaid Writ againſt him, or againſt whoever elſe is in the ſaid Lands.

ENTRY *in caſu Proviſo*, lies if Tenant in Dower aliens in Fee, or for Term of Life, or for another's Life living the Tenant in Dower, he in the Reverſion ſhall have this Writ.

ENTRY *in caſu conſimili*, is a Writ that lies where Tenant for Life, or Tenant by the Courtſey aliens in Fee, he in the Reverſion ſhall have this Writ.

ENTRY *ſine aſſenſu Capituli*, lies where an Abbot, Prior, or ſuch as has Convent or Common Seal, aliens Lands or Tenements of the Right of the Church, without the Aſſent of the Convent or Chapter, and dies, then the Succeſſor ſhall have this Writ.

ENVELOPE, in Fortification, is a Mount of Earth, ſometimes raiſed in the Ditch of a Place, and ſometimes beyond it, being either in form of a ſimple *Parapet*, or of a ſmall *Rampart* bordered with a *Parapet*. Thoſe *Envelopes* are made when one would only cover the weak Places with ſingle Lines, without any Deſign of advancing toward the Field, which cannot be done but by Works that require a great deal of Breadth; ſuch as *Horn-works*, *Half-Moons*, &c.

Theſe *Envelopes* are ſometimes called *Sillons*, *Contergards*, *Conſerves*, *Lunettes*, &c.

ENUNCIATION, with the Logicians, is the ſame as a Propoſition.

ENURNY, the Herald's Term for a *Bordure* of a Coat of Arms being charged with any kind of Beaſts.

ENVY, is by ſome well enough defined to be an Uneaſineſs of the Mind, cauſed by the Conſideration of a Good we deſire, obtained by one we think ſhould not have had it before us.

EPACMASTICA, is a Fever that commonly grows ſtronger. *Blanchard*.

EPACT, is uſed for a Number, whereby we note the Exceſs of the common *Solar Year* above the *Lunar*, and thereby may find out the Age of the Moon every Year: For the *Solar Year* conſiſting of 365 Days, the *Lunar* but of 354, the *Lunations* every Year get 11 Days before the *Solar Year*; but thereby in 19 Years the Moon compleats 20 times 12 *Lunations*, or gets up one whole *Solar Year*; and having finiſhed that Circuit, begins again with the *Sun*; and ſo from 19 Years to 19 Years: For the ſirſt Year afterwards, the Moon will go before the *Sun* but a 11 Days; the ſecond Year 22 Days, which is called the *Epaet* of that Year; the third Year 33 Days; but 30 being an entire *Lunation*, caſt that a

way, and 3 ſhall be that Year's *Epaet*, the next Year 14; and ſo on, adding Yearly 11 Days, and caſting away 30, when the Number amounts to more.

To find the *Epaet*, having the Prime or Golden Number given, you have this

R U L E.

Divide by 3, for each one left add Ten.
30 reject; the Prime makes *Epaet* then.

Example.

Anno 1701, Golden Number 11, divided by 3, leaves 2; therefore 10 times 2, which is 20, added to 11, makes 31, from which take 30, the Remainder is 1, the *Epaet* for the Year 1701.

EPANORTHOSIS, is a Greek Word, the ſame with *Correctio* or *Emendatio* in Latin; and ſignifies a Pathetical Form of Speech, in which the firſt Expreſſion appearing too weak, the Speaker ſtill endeavours to correct or mend it, by uſing ſtronger ways of ſpeaking.

EPAPHALESIS, is an irritated or repeated *Phlebotomy*. *Blanchard*.

EPAR: See *Hepar*.

EPARMATA, are Tumours of the Glandules, called *Parotes*, behind the Ears. *Blanchard*.

EPAULE, in Fortification, is the Shoulder of the Baſtion, or the Angle of the *Face* and *Flank*; whence that Angle is often called the Angle of the *Epaule*.

EPAULEMENT, in Fortification, is a *Side-work* made either of Earth thrown up, of Bags of Earth, Gabions, or of Faſcines and Earth, of which latter make the *Epaulements* of the Places of Arms for the Cavalry behind the Trenches are. Sometimes the Word

EPAULMENT is uſed for a *Demi-Baſtion*; and ſometimes it ſignifies a *Square Orillon*, which is a Maſs of Earth almoſt Square, faced and lined with a Wall, and deſigned to cover the Cannon of a *Cazemate*.

EPENTHESIS, in Grammar, is the Addition of a Vowel or Conſonant in the Middle of a Word; but if it be prefix'd, 'tis called *Prothefis*, if added at the End *Paragoge*.

EPELÆUM, is the Place from the *Hypogaſtrium*, or Part of the Abdomen, to the Secret Parts. *Blanchard*.

EPHELIS, or *Ephellides*, is *Freckles* in the Face, Neck, or Hands, &c.

EPHELCIS, is that bloody Subſtance which is brought up in ſpitting of Blood: Alſo a Shell or Cruſt that is brought over Ulcers. *Blanchard*.

EPHEMERA, or *Diaria*, is a continued Fever which laſts but a Day; if it laſts above a Day, it is called *Synochus Simplex*. *Blanchard*.

EPHEMERIS, thoſe Books or Journals which contain the Daily Motions of the Planets, and other Circumſtances relating thereto, for every Day in the Year, are called an *Ephemeris*, or *Ephemerides*.

EPHIALTES, or *Incubus*, the *Night-Mare*, is a depraved Imagination, whereby People aſleep fancy that their Wind-pipe is oppreſſ'd by ſome ſuperincumbent Body; and that their Breath is ſtopp'd: This ſeems to proceed from Compreſſion of the *Cerebellum*, when the Ventracles are too full of Moisture; for if thoſe who are thus affected lie upon their Backs, then the whole Bulk of the Brain lies upon

upon the *Cerebellum*; whereupon all the Pores and Passages being stop'd by so much Weight, the Spirits are hindred from influencing the Nerves called *Per vagum*, and the *Intercoſtal Nerves*; which being thus deſtitute of Spirits, the Lungs are oppreſſed and ſtag, and cannot perform their Office. *Blanchard.*

EPIDROSIS, is Sweating.

EPHIMERIS, or *Ephimerides*, is a Diary or Daily Register of the Motions and Places of the Heavenly Bodies, eſpecially ſhewing their Place at Noon: The ſame with *Ephemeris*.

EPHIPTIUM, or *Sella Equina*, or *Turſuca*, is Part of the Bone *Sphenoides*, wherein the *Pituitary Gland* is placed.

EPIALA, a kind of continual Fever, wherein both Heat and Cold is felt at the ſame time. *Blanchard.*

EPICARPIUM, is a Medicine applied outwardly like a Plaiſter or a *Cataplaſm*; applied to the Puſle or Wriſt of the Hand to drive away intermitting Fevers.

EPICAUMA, is a cruſty Ulcer that ſometimes happens to the Black of the Eye.

EPICERASTICA, are Medicines which obtund and temperate ſharp Humours.

EPICHEIRESIS, the ſame with *Encheireſis*.

EPICHEREMA, is a kind of Complex Argumentation conſiſting of many Propoſitions depending one upon another, whereby at laſt ſome particular Point is made out: As when *Cicero*, in his Oration *pro Milone*, argues, That thoſe who lay in wait to deprive a Man of his Life, or of his Money, may, by the Law of Nature, of Nations, and by common Practice, be juſtly ſlain: And therefore, ſince it appears that *Clodius* did by ſeveral Acts prove himſelf to be in ſuch a Deſign, 'twas lawful for *Milo* to kill him. 'Tis a kind of *Sortes*, which ſee.

EPICRASIS, is a gradual Evacuation of ill Humours in the Blood.

EPICUREAN Philoſophy, was the Natural Philoſophy firſt taught by *Epicurus* and *Democritus*, and afterwards delivered in Verſe by *Lucretius*: It is much the ſame with the preſent Mechanical Philoſophy, which ſee.

EPICYCLE, a little Circle whoſe Center is in the Circumference of a greater; or a ſmall Orb, which being fixed in the Deferent of a Planet, is carried along with its Motion, and yet with its own peculiar Motion, carries the Body of the Planet faſtened to it round about its proper Center, which Ancient Aſtronomers attribute to all the Planets, for ſolving their Appearances, except the Sun.

EPICYEMA, is a Superſtation.

EPIDEMICK Diſeaſe, is one proceeding from a common Cauſe, ſpreading it ſelf over divers Countries at divers times; ſuch are the Plague, Malignant Fevers, &c.

EPIDERMIS: See *Cuticula*.

EPIDIDYMIS, or *Epididymida*, or *Pariſtata*, in Latin *Supergeminalis*; it is a winding Veſſel, making a Figure like the Winding of crooked Veins that are ſwolln with ill Blood, and is affixed to the Back of the Teſticles: Its greater Globe is annexed to the Teſticles, conſiſting of one Veſſel or Paſſage above five Ells long: The leſſer Globe is connected to the Veſſel that carries the Seed. *Blanchard.* See *Teſtes*.

EPIGASTRICK Artery, is ſaid by ſome to be a Branch of the *Black Artery*; and diſtributes it ſelf amongſt the Muſcles of the *Epigaſtrius*.

EPIGASTRIUM, is the Fore-part of the *Abdomen* or *lowermoſt Belly*, whoſe upper Part is called *Hypochondrium*, the middle Part *Umbilicalis*, and the lowermoſt *Epigaſtrium*.

EPIGLOTTIS; is the fifth Cartilage of the *Larynx*, the Cover of the Opening of the Wind-pipe: It is alſo called *Sublinguim*: See *Cion*.

EPIGONATIS, is the Whirl-bone of the Knee:

EPILEPSY, or *Morbus Caducus*, is the Falling-Sickneſs, becauſe that the Perſons affected fall down on a ſudden; or *Herculeus*, becauſe it is hard to be cured; alſo *Laes Deifica*, *Sonticus*, *Comitalis*, *Sacer*, &c.

EPINYCTIDES, are Pimples that ſend forth Matter, and are painful, eſpecially in the Night. *Blanchard.*

EPIPAROXYSMUS, is when a Patient endures more Fits in a Fever than uſual, which happens in inordinate Converſe. *Blanchard.*

EPIPEOMETRY, in Mathematicks, ſignifies the meaſuring of Figures that ſtand on the ſame Baſe.

EPIPHONEMA, is an *Exclamation* containing ſome Sentence, or great Senſe, placed at the End of a Diſcourſe; being a preſſing and lively Reflection upon the Subject whereof we ſpeak.

EPIPHORA, in general, ſignifies a Deſluxion of Humours into any part; but is more eſpecially applied to denote the Deſluxion of a thin Rheum from the Eyes, which is commonly called involuntary Weeping, and flows continually from the Corners of the Eyes.

EPIPHYSIS, *Appendix*, *Adnaſcentia*, *Addamentum*, ſignify one Bone that grows to another by ſimple and immediate Contiguity, though not with ſo even a Surface, but with ſome kind of Ingreſs of one Bone into the Cavity of the other, like that Coarticulation wherewith the Bones form the Joints, but without any Motion. *Blanchard.*

EPIHYLLOSPERMIOUS Plants, are the ſame with the *Capillaries*, which bear their Seed on the Back-part of their Leaves: See *Capillaries*.

EPIPLASMA, the ſame with *Cataplaſma*.

EPILOCELE: See *Enteroccephalocela*.

EPILOIS dextra, a Branch of the *Celiac Artery*, which runs through the Right Side of the inner or hinder Leaf of the Caul, and the *Colon* that is next to it.

EPILOIS poſtica, is a Branch of the *Celiac Artery*, ſpringing out of the lower end of the *Splenica*, and running to the hinder Leaf of the *Omentum*, and the *Colon* annexed to it.

EPILOIS ſiniſtra, is a Branch of the *Celiac Artery*, and is beſtowed on the Lower and Left Side of the *Omentum*.

EPILOMPHALUM, is a Navel Rupture, when it jets out by reaſon of the Inteſtines or Caul bearing too hard upon it.

EPILOON, *Omentum*, or *Reticula*, the Caul, is a Cover ſpread over the Inteſtines, ariſing from the bottom of the little Ventricle, and the Back of the Gut *Colon*; to wit, from the Doubling of the *Peritoneum*: It is ſhaped like a Net, or a Fowler's Bag; and abounds with ſeveral Sanguinary Veſſels. Its Uſe is to cheriſh the Stomach and the Guts with its Fat. *Blanchard.*

EPI SARCIDIUM, the ſame with *Anaſcara*.

EPISEMASIA, is the very Time that a Diſeaſe firſt ſeizes a Perſon; and is properly called *Significatio*. *Blanchard.*

EPIſION, is the Place of the Secret Parts, or *Aqualculus*. *Blanchard.*

EPIſPASTICKS, the ſame with *Attrahentia*, or Bliſters.

EPIſPHERIA, are Windings and Turnings in the outer Subſtance of the Brain, that the Sanguiferous Veſſels may paſs more ſecurely. *Blanchard.*

EPIſTO-

EPISTOMIA, are the utmost Gapings and Meetings of Vessels.

EPISTROPHEUS, or *Cardo*, is the second Vertebra of the Neck; so called from turning, because the Head turns upon it. *Blanchard.*

EPISTYLE, in Architecture, is a Mass of Stone, or Piece of Timber laid upon the Capital of a Pillar.

The Ancient *Grecians* frequently made use of this Word, to signify that which we call the *Architrave*.

'Tis the first Member of the *Entablature*, and is usually broken into two or three Divisions, which the Architects call *Fascia*, Swathes, Fillets, Bands, or Lifts.

EPITHEME, is a Medicine of a Liquid Form, externally to be applied to some particular Part.

EPITRITUS, a Foot of a Latin Verse consisting of four Syllables; of which the *Grammarians* reckon four kinds.

The First is compounded of an *Iambus* and a *Spondeus*, as *Salutantes*, where the first Syllable is short, and all the rest long.

The Second is made out of a *Trocheus* and a *Spondeus*; as *Cincitati*, where the first Syllable is long, the second short, and the two last long.

The Third is compounded of a *Spondeus*, and an *Iambus*; as *Communicans*, where the two first Syllables are long; the third short, and the last long.

The Fourth consists of a *Spondeus* and a *Trocheus*; as *Incantare*, where the three first Syllables are long, and the last short.

EITROPE, is a Figure in Rhetoric, whereby we freely grant a thing that might be deny'd, to obtain another that we desire.

EPNEUMATOSIS, the same with *Expiratio*.

EPOCHA, or *Epoche*, in Chronology, signifies some remarkable Occurrence, from whence some Nations date and measure their Computation of Time.

The *Julian Epocha* takes its Name from *Julius Caesar's* Reformation of the *Roman Calendar*; which was done 45 Years before Christ, in the 708 Year from the building of *Rome*, and in the 731 Olympiad.

The *Ethiopick Abyssyn*, or as some call it, the *Diocletian Epocha*; others the *Era* of the Martyrs, because it bore Date with a very severe Persecution: This *Epocha* began Aug. 29. A.D. 284. and in the first Year of the Emperor *Diocletian*. 'Tis used by the *Egyptians* and *Abyssynes*.

The *Turkish* or *Arabick Epocha*, which they call the *Hagira*, bears Date from *Mabomet's* Flight from *Mecca*, A.D. 622. July 16.

The *Persick* or *Jesdegerdick Epocha*, takes its Date either from the Coronation of the last *Persian* King *Jesdegerdis*, or *Jesdagerdis*; as some say; or from his being conquered rather by *Ottoman* the *Saracen*, which was June 16. A.D. 632.

EPOMIS, is the upper part of the Shoulder, called also *Acromion*.

EPOMPHALUM, is a Plaster, or any such thing, applied to the Protuberances of the Navel.

EPULIS, is an Excrescence in the Gums, which is so large, as sometimes to hinder the opening of the Mouth.

EPULETICK Medicines, are the same with *Cicatrizantia*.

EQUABLE Motions, are such as always continue the same Degree of Velocity, and are neither accelerated nor retarded; but if there be an Acceleration or Retardation of the Velocity of two or more

Bodies, and it be exactly and uniformly the same in them both or all, they say such Bodies are

EQUABLY Accelerated or retarded.

EQUALITY, is the exact Agreement of two things in respect of Quantity.

EQUANIMITY, is an even, equal, calm Frame of Mind and Temper under good or bad Fortune; whereby a Man appears to be neither Dispirited, Soured, nor rendred Uneasy by Adversity; nor puffed up, nor overjoy'd with Prosperity.

EQUATION, or the *Total Prosthapheresis*, in the Ptolemaick Theory of the Planets, is the Difference between the Planets *mean* and *true* Motion; or the Angle made by the Lines of the true and mean Motion of the Center: But the

EQUATION or *Physical Prosthapheresis*, is the Difference between the Motions of the Center of the *Epicycle* in the *Equant*, and in the *Eccentric*; as the

EQUATION, or *Optical Prosthapheresis*, is the Angle made by two Lines drawn from the Center of the *Epicycle* to the Centers of the World, and of the *Eccentric*.

EQUATION of the Orbit, is the same with the *Total Prosthapheresis*, or *Equation Total*.

EQUATION, in Algebra, is a mutual comparing of two equal things of different Denominations; as $3s. = 36d.$ $10 \text{ Crowns} = 2l. 10s. = 50s. = 600d. = 2400 \text{ Farthings}$, &c. $a = b + d$, $c + R$

$$36 = \frac{c}{2}, \text{ \&c.}$$

The *Terms of an Equation*, are the several Quantities or Parts of which any Equation is composed, connected together by the Signs + and —: As in this Equation $a = b + c$, the Terms are a , b , and c , where 'tis supposed, that some Quantity represented by a , is equal to the Sum of b and c , or to b and c added together.

Whenever any Question or Problem is proposed in Algebra, we always suppose the thing sought or required to be known or done; and then by putting the Letter a , or some other Vowel (most now use the last Letters of the Alphabet z, x, y) for the unknown Quantity, or for the Thing sought, and Consonants for whatever is known or given, in order to distinguish one from the other: The Question or Problem is first thoroughly considered, and then duly stated; and after this judiciously compared, transformed, and varied by Addition, Subtraction, Multiplication, Division, Extraction of Roots, &c. according as the Nature of the Thing and the Rules of Art direct: till at last the Quantity sought, or at least some Power of it, becomes equal to some known or given Quantity, and so is it self of consequence discovered.

After a Question is duly stated, 'tis proper to consider whether it be subject to any Limitations or not: To which end the Writers of Algebra give these general Rules.

1. If the Quantities sought or requir'd, are more than the number of the given Equations, the Question is capable of innumerable Answers: See *Kersey's Algebra*, p. 30r. Vol. I.

2. But if the given Equations, independent one upon another, are just as many as the Quantities sought, then the Question hath only one certain and determinable number of Answers.

3. If the Quantities sought or required, are less in number than the given Equations, the Question is yet more limited, and is sometimes discoverable to be impossible to be resolved, by reason of such Equations being inconsistent with each other.

EQU

The Natural Day is measured not only by one entire Conversion of the *Equinoctial* or 24 *Equinoctial* Hours, (which is indeed taken to be performed in equal Times) but increases by so much, as answers to that Part of the *Sun's* (or *Earth's* Annual Motion) as is performed in that Time. For when that Part of the *Equinoctial*, which (with the Sun) was at the Meridian Yesterday at Noon, is come thither again to Day: It is not yet Noon, (because

(because the Sun is not now at the Place where Yesterday he was, but is gone forward about one Degree more or less) but we must stay till that Place where the Sun now is, comes to the Meridian, before it be now Noon.

This Additament (above the 24 *Equinoctial Hours*, or entire Conversion of the *Equinoctial*) is upon a double Account unequal.

First, Because the Sun, by reason of its *Apogæum* and *Perigæum*, doth not at all Times of the Year, dispatch in one Day an equal Arch of the *Ecliptick*; but greater Arches near the *Perigæum*, which is about the Middle of *December*; and lesser near the *Apogæum*, which is about the Middle of *June*; as will appear sufficiently by the *Tables* of the Sun's Annual Motion.

Secondly, Though the Sun should in the *Ecliptick* move always at the same rate, yet equal Arches of the *Ecliptick*, do not in all Parts of the *Zodiack* answer to equal Arches of the *Equinoctial*, by which we are to estimate Time; because some Parts of it, as the two Solstitial Points, lie nearer to a parallel Position to the *Equinoctial* than others; as these a-

bout the two *Equinoctial* Points, where the *Ecliptick* and *Equinoctial* do intersect: Whereupon an Arch of the *Ecliptick* near the Solstitial Points, answers to a greater Arch of the *Equinoctial*, than an Arch equal thereto near the *Equinoctial* Points; as doth sufficiently appear by the Table of the Sun's Right Ascension.

If you imagine another Sun to move in the Heavens in an equal Motion, not in the *Ecliptick*, but in the *Equinoctial*; the Difference between their coming to the Meridian every Day (or to any one and the same Hour-circle) will be the *Equation of Time*. And because the true Sun, and that Point of the Equator where his right Ascension ends, come always to the Meridian together, the *Equation of Time* may be defined to be that Space of Time which is passed over, while an Arch of the Equator, comprehended between the extreme Point of the true Sun's Ascension, and the Place of the feigned Sun, passes over the Meridian: And if this Arch be turned into Time, it gives the true *Equation of Time*.
Dr. Greg. Astron.

Mr. Flamsteed's Tables of Equation of Natural Days.

Leap-Year.

Jan.		Febru.		March.		April.		May.		June.		July.		August.		Septem.		Octob.		Novem.		Decemb.		
M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	
18	47	14	49	10	00	0	41	4	10	0	59	4	47	4	26	3	58	13	22	15	19	5	28	
29	10	14	48	9	43	0	24	4	11	0	47	4	55	4	16	4	19	13	36	15	10	4	59	
39	32	14	46	9	26	0	*	8	4	12	0	34	5	2	4	5	39	13	49	15	01	4	31	
49	54	14	43	9	9	0	*	7	4	13	0	22	5	9	3	54	5	0	14	2	14	50	4	2
510	15	14	40	8	51	0	22	4	12	0	*	10	5	15	3	43	5	20	14	14	14	38	3	33
610	36	14	36	8	33	0	37	4	10	0	*	3	5	20	3	31	5	41	14	26	14	26	3	3
710	55	14	31	8	15	0	52	4	10	0	16	5	25	3	18	5	1	14	37	14	13	2	33	
811	14	14	26	7	57	0	Wach	6	8	0	29	5	30	3	5	6	22	14	47	14	00	2	3	
911	32	14	20	7	39	0	Wach	19	4	5	0	42	5	34	2	53	6	43	14	57	13	45	1	35
1011	49	14	13	7	20	1	31	4	2	0	55	5	37	2	38	7	3	15	6	13	30	1	4	
1112	5	14	5	7	1	1	47	3	59	1	7	5	40	2	24	7	7	24	15	13	13	0	34	
1212	22	13	57	6	43	1	57	3	59	1	20	5	43	2	9	7	44	15	24	12	56	0	4	
1312	37	13	48	6	24	2	57	3	54	1	33	5	45	1	54	8	4	15	30	12	38	0	26	
1412	51	13	39	6	15	2	19	3	45	1	46	5	45	1	38	8	24	15	36	12	19	0	56	
1513	5	13	29	5	46	2	30	3	39	1	59	5	46	1	22	8	43	15	42	12	00	1	26	
1613	18	13	18	5	27	2	41	3	33	2	11	5	46	1	5	9	3	15	47	11	40	1	56	
1713	30	13	7	5	9	2	51	3	26	2	22	5	45	0	48	9	23	15	51	11	20	2	25	
1813	41	12	56	4	59	3	0	3	19	2	35	5	44	0	31	9	42	15	54	10	59	2	34	
1913	51	12	44	4	31	3	8	3	11	2	41	5	42	0	*	13	10	2	15	57	10	37	3	23
2014	0	12	32	4	13	3	16	3	3	2	59	5	40	0	*	5	10	21	15	59	10	14	3	52
2114	9	12	18	3	54	3	24	2	54	3	10	5	37	0	22	10	39	16	00	9	50	4	21	
2214	17	12	5	3	36	3	32	2	46	3	22	5	33	0	40	10	57	16	01	9	26	4	40	
2314	24	11	51	3	17	3	39	2	37	3	33	5	29	0	59	11	15	16	02	9	2	5	16	
2414	39	11	36	2	59	3	45	2	27	3	44	5	25	1	19	11	32	15	59	8	37	5	43	
2514	35	11	21	2	40	3	50	2	17	3	54	5	19	1	39	11	49	15	56	8	11	6	11	
2614	39	11	5	2	22	3	54	2	6	4	4	5	13	1	58	12	6	15	54	7	45	6	37	
2714	43	10	50	5	2	5	58	1	56	4	13	5	7	2	17	12	22	15	50	7	19	7	3	
2814	46	10	34	1	47	4	2	1	45	4	22	5	0	2	37	12	37	15	46	6	52	7	29	
2914	47	10	17	1	13	4	5	1	34	4	31	4	52	2	57	12	53	15	40	6	24	7	54	
3014	49					4	8	1	22	4	39	4	44	3	18	13	8	15	34	5	57	8	18	
3114	49			2	57			1	11			4	35	3	38			15	27			8	41	

The First after Leap-Year.

Jan.		Febru.		March.		April.		May.		June.		July.		August.		Septem.		Octob.		Novem.		Decemb.			
M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.		
1	9	4	14	48	10	4	0	45	4	10	1	0	4	45	4	28	3	53	13	18	15	21	5	33	
2	9	26	14	46	9	47	0	23	4	11	0	50	4	53	4	18	4	14	13	32	15	15	5	too low	
3	9	48	14	44	9	30	0	*	12	4	12	0	37	5	7	8	4	34	13	46	15	3	4	38	
4	10	10	14	41	9	13	0	*	3	4	13	0	25	5	7	3	57	4	55	13	59	14	53	4	low
5	10	31	14	37	8	55	0	18	4	12	0	*	13	5	13	3	46	5	15	14	11	14	41	3	40
6	10	50	14	32	8	37	0	33	4	11	0	*	0	5	18	3	34	5	36	14	23	14	29	3	10
7	11	9	14	27	8	19	0	13	4	10	0	13	5	24	3	21	5	56	14	34	14	7	2	40	
8	11	27	14	21	8	1	1	1	4	8	0	26	5	29	3	8	6	17	14	44	14	49	1	40	
9	11	43	14	15	7	43	1	16	4	8	0	39	5	33	2	55	6	38	14	54	13	49	1	40	
10	12	2	14	7	7	2	1	28	4	3	0	52	5	36	2	41	6	58	15	4	13	34	1	11	
11	12	18	13	59	7	6	1	41	4	0	1	4	5	39	2	27	7	19	15	13	13	17	0	41	
12	12	34	13	50	6	47	1	54	3	56	1	17	5	42	2	23	7	39	15	22	13	0	0	11	
13	12	47	13	41	6	28	0	3	3	51	1	39	5	44	1	58	7	59	15	28	12	43	0	*	19
14	13	2	13	31	6	10	2	16	3	46	1	43	5	45	1	42	8	10	15	34	12	24	0	*	19
15	13	15	13	21	5	51	2	27	3	40	1	56	5	46	1	26	8	38	15	40	12	5	1	19	
16	13	27	13	10	5	32	2	38	3	4	2	8	5	46	1	9	8	58	15	45	11	45	1	49	
17	13	38	12	59	5	14	2	48	3	28	2	20	5	45	0	52	9	18	15	50	11	25	2	18	
18	13	48	12	41	4	55	2	57	3	21	2	32	5	44	0	*	35	9	37	15	53	11	4	2	47
19	13	58	12	35	4	36	3	6	3	13	2	44	5	42	0	*	17	9	57	15	56	10	42	3	76
20	14	7	12	22	4	17	3	14	3	5	2	56	5	40	0	1	10	16	15	58	10	20	3	45	
21	14	15	12	8	3	50	3	22	2	56	3	7	5	38	0	18	10	34	15	59	9	56	4	14	
22	14	22	11	54	3	42	3	30	2	48	3	19	5	34	0	56	10	52	16	0	9	32	4	2	
23	14	28	11	40	3	22	3	37	2	39	3	30	5	30	0	55	11	10	16	1	9	8	5	42	
24	14	34	11	24	3	3	3	33	2	28	3	41	5	26	1	10	14	11	28	15	59	8	45	5	36
25	14	38	11	9	2	45	3	49	2	19	3	51	5	20	1	34	11	45	15	57	8	17	6	4	
26	14	42	10	54	2	26	3	53	2	9	4	1	5	14	1	53	12	2	15	55	7	51	6	30	
27	14	45	10	38	2	9	3	57	1	59	4	11	5	8	2	12	18	15	51	7	25	6	57		
28	14	47	10	21	1	51	4	1	1	48	4	20	5	2	2	32	12	33	15	47	6	59	7	33	
29	14	48	1	34	4	4	1	37	4	29	4	29	4	54	2	52	12	49	15	41	6	31	7	48	
30	14	49	1	17	4	7	1	25	4	37	4	37	4	46	3	43	13	4	15	35	6	3	8	12	
31	14	49	1	01	1	01	1	14	1	14	4	37	3	33	15	29						8	25		

The Second after Leap-Year.

The Second after Leap-Year.																									
Jan.		Febru.		March.		April.		May.		June.		July.		August.		Septem.		October.		Novem.		Decem.			
M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.		
1	8	59	14	48	10	8	0	49	4	9	1	5	4	43	4	30	3	48	13	14	15	23	5	42	
2	9	21	14	47	9	55	0	32	4	11	0	53	4	51	4	20	4	9	13	28	15	15	5	13	
3	9	43	14	45	9	34	0	* 16	4	12	0	40	4	58	4	10	4	29	13	42	15	5	4	45	
4	10	5	14	42	9	17	0	* 1	4	13	0	28	5	5	4	0	4	50	13	56	14	55	4	low	
5	10	26	14	38	8	53	0	14	4	12	0	16	5	11	3	49	5	10	14	8	14	44	3	47	
6	10	45	14	38	8	41	0	29	4	11	0	3	5	14	3	37	5	31	14	20	14	32	3	17	
7	11	5	14	28	8	24	0	44	4	10	0	*	10	5	23	3	24	5	51	14	31	14	20	2	47
8	11	24	14	23	8	5	0	58	4	8	0	* 23	5	28	3	11	6	5	12	14	41	14	6	2	47
9	11	40	14	14	7	47	1	12	4	6	0	36	5	32	2	58	6	33	14	51	13	52	1	47	
10	11	57	14	9	7	29	1	26	4	4	0	49	5	35	2	44	6	53	15	1	13	38	1	18	
11	12	1	14	1	7	10	1	38	4	1	1	1	5	38	2	30	7	14	15	11	13	21	0	38	
12	12	30	13	52	6	52	1	51	3	57	1	14	5	41	2	16	7	34	15	20	13	4	0	* 18	
13	12	44	13	43	6	33	2	3	3	52	1	27	5	43	2	2	7	54	15	26	12	47	0	* 12	
14	12	58	13	34	5	15	2	14	3	47	1	40	5	45	1	16	8	10	15	32	12	28	0	42	
15	13	14	13	24	5	50	2	24	3	41	1	53	5	46	1	30	8	33	15	38	12	6	1	12	
16	13	24	13	13	5	37	2	35	3	35	2	5	5	46	1	13	8	53	15	44	11	50	1	42	
17	13	35	13	2	5	18	2	46	3	29	2	17	5	45	0	56	9	13	15	49	11	30	2	11	
18	13	46	12	50	5	0	2	56	3	23	2	29	5	44	0	39	9	32	15	52	11	9	2	40	
19	13	56	12	37	4	14	4	3	15	2	41	5	42	0	21	9	52	15	55	10	47	3	0	40	
20	14	5	12	25	4	25	3	12	3	7	2	53	5	40	0	*	3	10	11	15	57	10	25	3	38
21	14	13	12	12	4	3	3	20	2	58	3	4	5	38	0	* 14	10	30	15	59	10	2	4	7	
22	14	20	11	57	3	44	3	28	2	50	3	10	5	35	0	31	10	48	16	1	9	38	4	35	
23	14	27	11	45	3	26	3	35	2	41	3	27	5	31	0	50	11	6	16	0	9	14	5	3	
24	14	32	11	28	3	8	3	42	2	31	3	38	5	27	1	9	11	24	15	59	8	49	5	29	
25	14	37	11	1	2	49	3	47	2	21	3	48	5	22	1	29	11	41	15	57	8	25	5	57	
26	14	41	10	58	2	31	3	52	2	11	3	59	5	16	1	49	11	58	15	55	7	57	6	23	
27	14	44	10	42	2	12	3	56	2	1	4	9	5	10	2	7	12	14	15	52	7	31	6	50	
28	14	47	10	25	1	55	4	0	1	51	4	18	5	3	2	27	12	29	15	48	7	5	7	16	
29	14	48	1	38	4	3	1	40	4	27	4	27	4	56	2	47	12	45	15	43	6	38	7	41	
30	14	49	1	22	4	6	1	28	4	35	4	35	4	48	3	8	13	0	15	37	6	10	8	6	
31	14	49	1	5	1	5	1	17	1	17	4	39	3	28	15	31						8	20		

The Third after Leap-Year.

	Jan.		Febru.		March.		April.		May.		June.		July.		August.		Septem.		Octob.		Novem.		Decemb.	
	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.
1	8	53	14	49	10	10	20	53	4	9	1	8	4	41	4	32	3	43	13	11	15	28	5	49
2	9	15	14	47	9	54	0	36	4	10	0	56	4	39	4	23	4	4	13	25	15	17	50	20
3	9	37	14	45	9	38	0	20	4	12	0	43	4	57	4	13	4	24	13	39	15	8	4	52
4	9	59	14	42	9	21	0	4	4	13	0	31	5	4	4	45	13	53	14	58	4	23	54	23
5	10	20	14	39	9	4	0	11	4	12	0	19	5	10	3	51	5	5	14	5	14	47	3	25
6	10	41	14	34	8	46	0	26	4	12	0	6	5	13	3	40	5	26	14	17	14	35	3	25
7	11	00	14	29	8	28	0	11	4	11	0	7	5	22	3	27	5	46	14	28	14	23	2	55
8	11	18	14	24	8	10	0	55	4	9	0	20	5	27	3	14	6	27	14	39	14	10	2	25
9	11	36	14	18	7	52	1	9	4	7	0	33	5	31	3	1	6	28	14	49	13	50	1	55
10	11	54	14	11	7	34	1	22	4	4	0	46	5	35	2	48	6	48	14	59	13	41	1	25
11	12	10	14	3	7	15	1	35	4	1	0	58	5	38	2	34	7	9	15	9	13	25	0	56
12	12	26	14	54	6	6	0	0	4	1	1	11	5	41	2	20	7	29	15	18	13	8	0	26
13	12	41	13	45	6	1	0	0	5	53	0	58	5	43	2	5	7	49	15	25	12	51	0	14
14	12	55	13	36	6	19	2	11	3	48	1	27	5	45	1	50	8	9	15	31	12	33	0	34
15	13	9	13	26	6	0	2	22	3	43	1	38	5	46	1	34	8	29	15	37	12	14	1	4
16	13	21	13	15	5	41	2	33	3	37	2	2	5	46	1	17	8	48	15	43	11	55	1	34
17	13	23	13	4	5	23	2	43	3	31	2	14	5	45	1	0	9	8	15	48	11	35	2	4
18	13	43	12	53	5	4	2	52	3	24	2	26	5	44	0	43	9	28	15	52	10	14	2	33
19	13	53	12	41	4	45	3	1	3	17	2	38	5	43	0	26	9	47	15	55	10	53	3	2
20	14	3	12	28	4	26	3	10	3	9	2	50	5	41	0	9	10	7	15	57	10	31	3	31
21	14	11	12	15	4	7	3	18	3	0	3	2	5	39	0	9	10	27	15	59	10	8	4	0
22	14	18	12	1	3	49	3	26	2	52	3	13	5	36	0	27	10	43	16	0	9	44	4	20
23	14	25	11	47	3	31	3	33	2	43	3	25	5	32	0	46	11	16	1	9	20	4	50	
24	14	31	11	32	3	13	3	41	2	34	3	36	5	28	1	5	11	19	16	0	8	55	5	23
25	14	36	11	16	2	54	3	46	2	24	3	40	5	23	1	24	11	37	15	58	8	30	5	50
26	14	40	11	1	2	31	3	51	2	14	3	57	5	17	1	44	11	54	5	56	8	4	6	17
27	14	43	10	46	2	17	3	55	2	4	4	7	5	11	2	32	12	15	33	7	38	6	44	
28	14	46	10	30	1	42	3	59	1	53	4	16	5	5	2	22	12	26	15	49	7	12	7	10
29	14	47			1	25	4	3	1	42	4	25	4	58	2	42	12	41	15	44	6	45	7	36
30	14	48					4	6	1	31	4	33	4	50	3	3	12	57	15	38	6	17	8	0
31	14	49			1	9			1	19	4	37	4	14	3	23							8	24

EQUATOR : See *Equinoctial*.

EQUICRURAL : See *Isofoles*.

EQUICULUS, or *Equus minor*, a Constellation in the Northern Hemisphere, consisting of 4 Stars.

EQUILATERAL Triangle : See *Triangle*.

EQUILIBRIUM, in Mechanics, is when the two Ends of a Balance hang fo exactly even and level, that neither doth ascend or descend, but do both keep in a Position parallel to the Horizon ; which is occasioned by their being both charged with an equal Weight.

EQUIMULTIPLES, are Numbers or Quantities multiplied by one and the same Number or Quantity : See *Proposition*, No. 13.

EQUINOCTIAL, (in the Heavens) or Equator on the Earth, is a great Circle, whose Poles are the Poles of the World. It divides the Globe into two equal Parts ; that is, the Northern and Southern Hemispheres. It passes through the East and West Points of the Horizon ; and at the Meridian is raised as much above the Horizon, as is the Complement of the Latitude of the Place.

Whenever the Sun cometh to this Circle, it maketh equal Days and Nights all round the Globe, because he then always rises due East, and sets due West, which he doth at no other time of the Year, whence it hath its Name. All Stars also which are under this Circle, or which have no Declination, do always rise due East, and set full West, &c.

All People living under this Circle, (which, in Geography, is called the Line) have their Days and

Nights equal : At Noon the Sun is in their Zenith, or directly over their Heads, and casts no Shadow.

From this Circle (on the Globes) is the Declination or Latitude accounted on the Meridian.

And the Circles which run through each Degree of Latitude or Declination, are called Parallels of Latitude or Declination.

Through this Equinoctial all the Hour-Circles are drawn at Right Angles to it, and through the Poles of the World, at every 15th Degree, on the Celestial Globe.

And the Equator on the Terrestrial Globe is divided by the Meridians into 36 equal Parts.

The Natural Day is measured by the Revolution of the Equator, and is ended when the same Point of the Equator comes again to the same Meridian, which is in 24 Hours.

Wherefore since the Equator (as all great Circles are) is divided into 360 Degrees, each Hour must be $\frac{1}{24}$ of that Number, or 15 Degrees ; therefore 1 Degree of the Equator will contain 4 Minutes of an Hour ; and 15 Minutes of a Degree, will make a Minute of an Hour, or 60 Seconds ; and consequently 4 Seconds answer to one Minute of a Degree.

Hence the following Tables are made for converting Degrees and Minutes, &c. of the Equinoctial into Time, and *Vice versa*.

T A.

TABLE I.

To convert Parts of the Equinoctial into Time.

Degrees.	Hours.	1
Minutes.	1	2
Seconds	2	3
Thirds.	3	4
1	0	4
2	0	8
3	0	12
4	0	16
5	0	20
10	0	40
15	1	0
30	2	0
60	4	0
90	6	0
180	12	0
360	24	0

Whose Use is this :

Suppose you would readily know how many Hours, Minutes and Seconds, &c. there are in 19 Degrees, 13 Minutes, 7 Seconds of the Equator.

H. " "

Against 15 Degrees, in the first Table, you find	1	0	0	0
Against 4 Degrees	0	16	0	0
Also against 10 Minutes you will find	0	0	40	0
And against 3 Minutes	0	0	12	0
Then against 5 Seconds you will find	0	0	0	20
And against 2 Seconds you have	0	0	0	8
Add all up together, and it makes	1	16	52	28

TABLE II.

To convert Time into Parts of the Equinoctial.

Hours	Degr.	Minut.	Degr.	1
		Second	1	2
		Thirds	2	3
		Fourth	3	4
1	15	1	0	15
2	30	2	0	30
3	45	3	0	45
4	10	4	1	0
5	75	5	1	15
6	90	6	1	0
9	135	10	2	30
12	180	20	5	0
15	225	30	7	30
18	270	40	10	0
21	315	50	12	30
24	630	60	15	0

Again, for the Use of this Table.

Suppose you would find how many Degrees, Minutes, Seconds, &c. of the Equator, answer to 23 Hours, 25 Minutes, 17 Seconds, and 9 Thirds.

H. " "

Against 21 Hours, in the Table, you find	315	10	0	0
Against 2 Hours	30	0	0	0
Against 20 Minutes you have	5	9	0	0
And against 5 Minutes	1	15	0	0
Then against 10 Seconds you find	0	12	30	10
And against 5 Seconds	0	0	15	0
Against 2 Seconds	0	0	30	0
Then against 6 Thirds there is	0	0	1	30
And against 3 Thirds you have	0	0	0	45

All which added rightly together, make 351 19 17 15

EQUINOCTIAL Colure : See Colure.

EQUINOCTIAL Dial, is that whose Plane lies parallel to the Equinoctial.

To make this Dial, is no more than with 60 Degrees of your Line of Chords to describe a Circle, wherein draw two Diameters crossing each other at Right-Angles; then divide this Circle into 24 equal Parts or Hours, which subdivide as you please.

Note, That every Hour is 15 Degrees, therefore the Half-hour will be 7 Degrees, 30 Minutes, and the Quarter 3 Degrees, 45 Minutes.

That being done, set up a straight Pin perpendicular to the Plane in the Center of the Circle, and place the Plane parallel to the Equinoctial, and the Meridian Line true North and South, and the Dial is fitted.

These Dials are commonly set up in a Frame to be elevated to any Latitude.

EQUINOCTIAL Orient : See *Orient*.

EQUINOCTIAL Occident : See *Occident*.

EQUINOXES, are the precise Times in which the Sun enters into the first Point of *Aries* and *Libra* ; for then moving exactly under the *Equinoctial*, he makes our Days and Nights equal. This he doth twice a Year, about the 10th of *March*, and 12th of *September*; which therefore are called the *Vernal* and *Autumnal Equinoxes*.

It is found by Astronomical Observation, That the *Equinoctial Points* (which are the first Points of the Signs *Aries* and *Libra*) go backward every Year 50 Seconds.

And our admirable Sir *Isaac Newton*, taking the Matter into Consideration according to his Principles, found, by Calculation, That they must recede 49 Minutes, 58 Seconds, which is surprizingly near the Truth.

The Space from the *Vernal* to the *Autumnal Equinox*, is 8 or 9 Days longer than from the *Autumnal* to the *Vernal*, by reason of the Position of the *Perihelion* of the Earth's Orbit near the *Winter Solstice*.

EQUINUS Barbatus, a kind of Comet, called also *Equinus Ellipticus*, *Equinus Quadrangularis* : See *Hippus*.

EQUIPOLLENCE, in Logick, is when there is an *Equivalence* or Agreement, either as to the Nature of the Thing, or as to the Grammatical Sense of any two, or more Propositions; or in plain Words, when two Propositions signify one and the same thing, tho' they express it after different manners; they are properly said to be *Equipollent*.

EQUITY, is the Virtue of treating all other Men according to common Reason and Justice, or as we would be gladly treated our selves, when we understand rightly what is our due.

EQUITY, in the Law, usually signifies the *Court of Chancery*, where Controversies are supposed to be determined according to the exact Rules of *Equity* and Conscience, by mitigating the Rigor of the Common Law, tho' even by the Common and Statute Law there is also an *Equity*. *Aequitas sequitur Legem*, is an old Maxim in Law; but from the great Increase of Suits in *Chancery*, some have thought fit to give it this Construction, That in all Causes after a Man has been at Law, he must go in to *Equity*.

EQUIVALENCE in Things, is that which expresses an Agreement in Nature or Circumstances, between any two Things proposed.

EQUIVOCAL, in Logick, is that which hath a doubtful or double Signification.

Any Equivocal Word, is that which contains more Significations than one, or that which serves for several Notions : See *Homonymous*.

EQUIVOCAL Generation, is the Production of Plants without Seed: Insects or Animals without Parents in the Natural Way of Coition between Male and Female.

The Learned World begins now to be satisfied, that there is nothing like this in Nature; and since the Use of Microscopes, and a more particular Application to Enquiries of this Kind, a prodigious Number of Plants have been discovered to have *Seeds*; and of Animals (*Insects*) have been found to be produced Univocally, or in the ordinary way of

Generation, which before were thought to be Univocally produced. See *Vol. II*.

ERASED, the Herald's Word, expressing any thing violently torn off from its proper Place; and 'tis used in Contradistinction to *Couped*, which signifies a Thing clean cut off.

ERECT Declining Dials, are those whose Planes are not directly opposite to any of the four Cardinal Points, but Decline from the Meridian or Prime Vertical Circle.

For the drawing of the Hour-Lines on these Dials, there is given the Latitude of the Place, and the Declination of the Plane, in order to find,

First, The Height of the Style above the Plane.

Secondly, The Distance of the Substyle from the Meridian.

Thirdly, The Inclination of the Meridians, or Difference of the Meridians; which are all the Requisites necessary to be known before the Dial can be described.

1. To find the Style's Height above the Plane, say,

As the Radius is to the Co-sine of the Plane's Declination :

So is the Co-sine of the Elevation of the Pole, to the Sine of the Style's Height.

2. To find the Substyle's Distance from the Meridian, say,

As the Radius is to the Sine of the Plane's Declination :

So is the Co-Tangent of the Elevation of the Pole, to the Tangent of the Substyle's Distance.

3. To find the Inclination of the Meridians, say,

As the Radius is to the Co-Tangent of the Declination :

So is the Sign of Elevation of the Pole, to the Co-Tangent of the Inclination of the Meridians.

These being found; Then with a Line and Plumet, let fall a Perpendicular to the Horizon, and that shall be the Meridian or Hour Line of 12.

Then if your Plane decline $\left\{ \begin{array}{l} \text{Westward,} \\ \text{Eastward,} \end{array} \right\}$ place the Substyle's Distance (from the Line of Chords) to the $\left\{ \begin{array}{l} \text{Right} \\ \text{Left} \end{array} \right\}$ Hand of the Meridian.

Also having found the Inclination of the Meridians, find what Angle each Hour makes at the Pole with the Substyle, by subtracting 15 Degrees for each Hour that is between the Substyle and Meridian, as long as it can be done from the Inclination of the Meridians; and by adding 15 Degrees for the other Hours.

And with the Hour-Angles at the Pole, find the Hour-Arches by this Proportion.

As the Radius is to the Sine of the Style's Height :: So is the Tangent of the Hour-Angle : To the Tangent of the Hour-Arch.

Of these Hour-Angles and Hour-Arches frame a Table, as was shewed in making a Horizontal Dial.

Example.

A South Erect Dial, Declining Eastward 45 Degrees, 00 Minutes. Latitude 51 Degrees, 32 Minutes.

The Requisites may be found by the foregoing Canons, *vi. z*

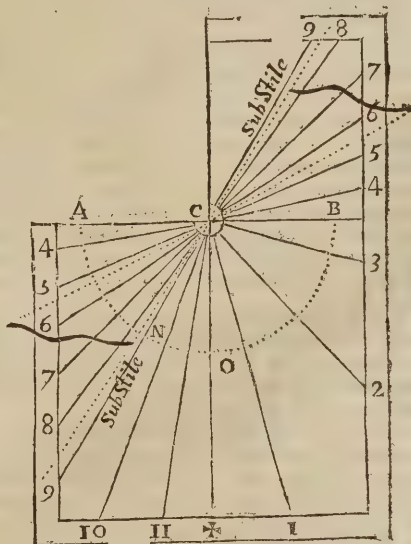
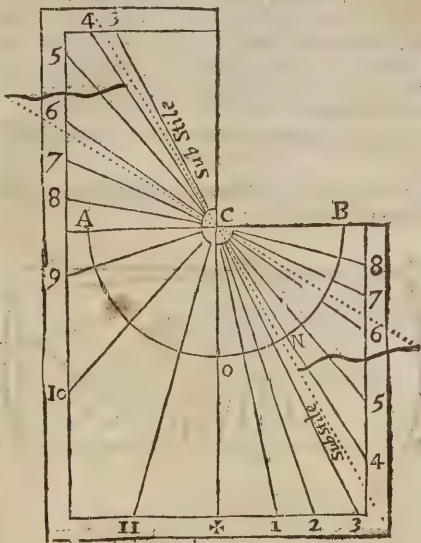
The Height of the Style,	26	06
Substyle's Distance from the Meridian,	29	21
Inclination of Meridians,	51	57

Now, since the Inclination of Meridians is less than 60 Degrees, and greater than 45 Degrees, 'tis certain the Substyle must be between 8 and 9 of the Clock.

Then the Hour-Angles at the Pole are also found by subducting 15 Degrees from the Inclination of Meridians (supposed to be set against 12) the Remainder will be for the Hour 11; and from that Angle against 11, subtract 15 Degrees, the Remainder set against 10; and from that Remainder subduct 15 Degrees, the Residue set against 9; and that because 'tis less than 15 Degrees, take the Difference to 15 Degrees, which set against 8; then by continual Addition of 15 Degrees, you'll have the Numbers against the remaining Hours.

Lastly, Find the Hour-Arches according to the Canon given for that Purpose: *viz.* by the continual Addition of the Sine of the Style's Height, 26 Degrees, 6 Minutes to the Tangent of every Hour's Distance from the Substyle, and that will give new Tangents of the Hour-Arches, as in the following Table.

The East Decliner.				
Hours	Angles at Pole.		Hour Arches.	
	D.	M.	D.	M.
3	83		374	31
4	68		347	31
5	53		330	20
6	38		319	01
7	23		310	37
8	8		33	34
Substyle	Substyle		Substyle	
9	6	57	2	26
10	11	57	10	3
11	36	57	18	19
12	51	57	29	21
1	66	57	45	58
2	81	57	72	27



To describe the Dial.

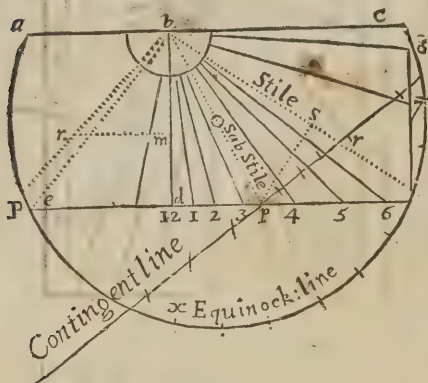
First draw the Horizontal Line ACB; and at Right-angles to it the Meridian CO 12; then with 60 Degrees of your Line of Chords, from C describe the Semi-circle AOB; and set off 29 Degrees, 21 Minutes (the Distance of the Substyle from the Meridian) from O to N, on the West Side of the Meridian, because the Plane declines East. Set off also the several Hour Arches (as) to Degrees, 37 Minutes for 7 and 5 a Clock, 18 Degrees, 19 Minutes for 11 and 1 a Clock, &c. both ways from the Substyle on the Circle NRO; and draw Lines from the Center C through these several Points: So you'll have the true Hour Lines defined.

Then from your Chords, set off the Style's Height 26 Degrees, 6 Minutes from N to R; and a Right-line

line drawn through *R* from *C*, represents the Axis or Style, and your Dial is finished; as also three others, viz. a South Erect Dial, declining West as much; and a North Erect Dial, declining East and West as much, only placing the Numbers of the Hours and the Style representatively upon each Plane.

An Erect Declining Dial may be Geometrically made thus:

Having given the Elevation of the Pole, and Declination of the Plane;



First draw two Lines intersecting each other at Right-angles: From the Point of Intersection, suppose *b*, make the Angle *e b d* equal to Elevation of the Equator; make another *n b d* equal to the Declination of the Plane. Draw *d e* perpendicular to the Meridian; from any Point taken at pleasure, suppose *d*, make *b n = d e*; from *n* let fall a Perpendicular to the Meridian *n m*; let this Perpendicular *n m* be transferred, and set upon the former Perpendicular on the other Side of the Meridian equal to *d p*.

Let the Substyle be drawn through *b* and *p*; unto which, in the point *p*, draw a Perpendicular for the Contingent, as *p r*. Then from *b*, through *r*, draw the Style, whose Altitude above the Substyle shall be equal to the Angle *p b r*.

From *p* to the Style, let fall the Perpendicular *p s*; make *p o* on the Substyle equal to *p s*: From *o*, at any Distance, describe the Equinoctial Circle, which divide into 24 or 48 parts, beginning your Division in that part of the Circle, *W*, which is cut by the Ruler applied to *b* and *x*, which is the point of Intersection of the Contingent and the Meridian.

Make points in the Contingent, where 'tis cut by a Ruler applied to the Center *o*, and every Division; through which points, from the Center *b*, draw the Hour-Lines.

ERECT Declining Planes: See Dial Planes.

ERECT Direct Planes: See Dial Planes.

ERECT Direct East or West Dials: See Direct Erect East or West Dials.

ERECT Direct South or North Dials: See Prime Vertical.

ERECTORES Penis, by some called *Erigentes*, by others *Directores*, by *Spigelius*, *Collaterales Penis*; are a pair of Muscles arising Flethy from the outward Knob of the *Os Ilicium*, below the Beginning of the Cavernous Bodies of the *Penis*, in whose thick Membranes they are inserted; Their Use is to help to erect the *Penis*, which they do by pulling towards the *Ossa Pubis*, whereby its greatest Vein

is compressed, and the reffluent Blood denied its passage under those Bones, and therefore the *Penis* must swell.

ERICHTHONIUS: See *Auriga*.

ERIDANUS, or *Radus*, a Southern Constellation consisting of 28 Stars.

ERMENOIS, is when the Field is Or, and the Powdering is Sable.

ERMIN, in Heraldry, signifies a Coat where the Field is Argent, and the Powdering is Sable.



And on the contrary,

ERMINES, is when the Field is Sable, and the Powdering Argent.



ERODENTIA, are Medicines which grow and prey upon the Flesh with their Acute Particles. *Blanchard*.

ERPES: See *Herpes*.

ERRHINES, are Medicines designed to purge away pituitous Humours from the Head, without making the Patient sneeze, tho' to be taken up the Nose. They are either *Liquid*, *Soft*, or *Solid*.

The *Liquid* are made of the Juices of *Cephalick*, cleansing Herbs, extracted by Wine or other Liquors; to which Spirit of Wine is sometimes added; or of a Decoction of fit Simples, to which are added sometimes Juices, Honey, Syrup, and Powders too.

The *Soft* is made of Powders, with Honey, Oil, or Juices, boiled to a kind of Ointment.

The *Solid* is given either in form of a Powder, and that has place especially in Medicines which provoke Sneezing; or in form of a Pellet, and it is called *Nasale*, and is prepared of fit Powders mixed with viscid Extractions from Seeds, Gums, Roots, &c. with Wax, or with Turpentine. *Blanchard*.

ERRONES, or *Erratick*, or *Wandering Stars*; the same with the *Planets*.

ERROR, in Law, signifies a Fault in pleading, or in the Process; and thereupon the *Writ of Error* is brought to remedy this Oversight; which *Writ* is that which lieth to redress false judgments given in any Court of Record.

There is likewise a *Writ of Error* to reverse a Fine or Recoveries; and for redressing and preventing Errors in Fines and Recoveries: *Vide* the Statute 23 *Car. 1. C. 3.* for inrolling them; and *vide* 16th of *Car. 2. C. 4.*

ERYSIPELAS, is a Swelling of a bright yellowish Colour, inclining to Red (whence its Name is derived) possessing the Skin, and going no deeper, attended with a pricking Pain, but not beating; it hath a Sympomatick Fever accompanying it usually; it is apt to spread, and sometimes blisters the Skin: If the Skin be preffed with the Finger, it yieldeth, and the Redness vanishes for a time.

ERYSIPELATODES, is a Swelling like the former, tho' with easier Symptoms; and therefore may be taken for a Kind of *Bastard Erysipelas*; in it the Skin is of a more dark Colour.

ERYTHREMATA, are red Spots like Fleabites, commonly in Pestilential Fevers. *Blanchard*.

ERYTHROIDES, is the Red Membrane of the Testicles, the first of the proper Tunicks. *Blanchard*.

ESCALADE, or *Scalade*, is a furious Attack upon a Wall,

Wall, or a Rampart, carried on with Ladders to mount up upon it, without going on inform, breaking Ground, or carrying on of Works to secure the Men.

ESCARP: See *Scharp*.

ESCHAR, is a Crust, or hard Skin, Rind, or Shell brought over any Ulcer, or raised with a red hot Searing-Iron.

ESCHAROTIE, is a Searing-Iron, a small Pone, a Cautey, or the like, which burns the Skin and Flesh into a crusty Substance. *Blanchard*.

ESCHEAT, in Law, signifies any Lands or other Profits that fall to a Landlord within his Manor by way of Forfeiture, or the Death of his Tenant, dying without Heir General or Special, or leaving his Heir within Age, and Unmarried. *Mag. Charta, Chap. 31*.

ESCHEATOR, is an Officer who takes notice of the King's Escheats in the Country, and certifies them into the Exchequer.



ESCOCHEON of *Pretence*, is an Inesccheon, or little Esccheon, which a Man that hath married an Heiress, and hath Issue by her, may bear over his own Coat of Arms, and in it the Arms of his Wife; and the surviving Issue will bear both Coats Quarterly.

ESCOUADE, is usually the third part of the Company of Foot; 'tis so divided for mounting of Guards, and for the more convenient relieving one another: 'Tis equivalent to a *Brigade* of a Troop of Horse.

ESCUTCHEON (from *Scutum* a Shield) is the Coat or Field on which any Arms are born in Heraldry; 'tis usually of this Form: And in it the Heralds give divers Names to several Points or Places: Thus, the Point D, they call the *Dexter Chief*; C, is the *Middle Chief*; and S, the *Sinister Chief* Point; H, is called the *Honour Point*; and F, the *Fesse Point*; N, is called the *Nombril Point*; and d, the *Dexter Base*; B, the *Middle*; and s, the *Sinister Base-Point*.

the *Dexter Base*; B, the *Middle*; and s, the *Sinister Base-Point*.

ESPAULEMENT, the same with *Epaulement*, a Work in Fortification made on the Side of a Bastion, of either Earth thrown up, Gabions, Fascines, &c. And those Epaulements which are for the Places of Arms for the Cavalry behind the Trenches, are usually made only of Fascines and Earth. This Word signifies also sometimes a *Demi-Bastion*; and sometimes 'tis used for a Square Orillon, or a Square Mass of Earth, faced or lined with a Wall, designed to cover the Cannon of a *Cazemate*.

ESPAUL, or *Epaule*; (which see in Fortification, the same with the Shoulder of a Bastion, or the *Angle of the Shoulder*; which see.

ESPLEES, a Term in Law, signifying the full Profit that the Ground or Land yieldeth.

ESPLENADE, a Term in Fortification, the same with the Glacis of the Counterscarp originally; but now 'tis usually taken for the empty Space between the Glacis of a Cittadel, and the first Houses of the Town.

ESSENCE, is that which constitutes the peculiar Nature of any thing, and makes it be what it is. Thus the Essence of a Circle is, that its Radii, or Semi-diameters be all equal; the Essence of a Square is, that it have 4 Right-angles, and 4 equal Right-lined Sides.

ESSENCE also, in Chymistry, signifies the *Bal-*

samick part of any thing separated from the thicker Matter, so that whenever this is done by means of Extraction, the *Balsamick* part is called *Essence*, by way of Eminence; sometimes thickned Juices are called *Essences*: But 'tis better to call these by their own Name, to avoid Confusion. Some call Compounds of Oil and Sugar *Essences*; but it is an Abuse of the Word. *Blanchard*.

ESSENDI *quietum de Tolonia*, is a Writ that lieth for Citizens and Burgesies of any City or Town, that hath a Charter or Prescription, to exempt them from Toll through the whole Realm, if the same happen to be any where exacted of them.

ESSENTIAL *Properties*, are such as necessarily depend on the Nature and Essence of any thing. Thus 'tis the Essential Property of every Rectilineal Triangle, to have the Sum of its 3 Angles equal to 2 Right ones. And of every Rectangled Triangle to have the Square of the Hypotenuse equal to the Sum of the Squares of the Legs.

ESSENTIAL *Salt* of Plants is thus drawn: The Plant is pounded in a Mortar, and its Juice extracted and filtrated, which after that is set in a Cellar, or some such cool Place to Crystallize, and the Salt will shoot out into Crystals every way. This Salt is the true or *Essential Salt* of the Plant; for here is no change at all made in it by the force of Fire, but the means of drawing it are easy and natural.

ESSERE, *Sora*, and *Sore*, are little Pusshes or Wheals, something red and hard, which quickly infect the whole Body with a violent itching, as if one were stung with Bees, or Wasps, or Flies, or Nettles; yet they vanish after a little time, and leave the Skin as smooth and well colour'd as before. It differs from an *Epinychis* in this, that an *Epinychis* sweats out Matter, but an *Essere* does not. *Blanchard*.

ESSOYNE, in Law, signifies the Allegation of an Excuse from him that is summon'd to appear, and answer to an Action Real, or to perform Suit to a Court Baron upon just Cause of Absence. This the *Civilians* call *Excusatio*.

The Causes that serve to *Essoyne* any Man summon'd, are divers; but drawn chiefly to 5 Heads: Whereof

The First is, *Ultra Mare*, whereby the Defendant shall have 40 Days.

The Second, *De Terra Sancta*, where the Defendant shall have a Year and a Day, and these must be laid in the beginning of the Plea.

The Third is called, *Malo Veniendi*, call'd also *Common Essoyne*.

The Fourth is, *De malo lecti*.

The Fifth, *De servitio Regis*.

ESSONIO *de malo lecti*, is a Writ directed to the Sheriff, for the sending of 4 lawful Knights to view one that hath *Essoyn'd* himself, *De malo lecti*.

ESTIVAL *Occident*: See *Occident*.

ESTIVAL *Orient*: See *Orient*.

ESTIVAL *Solstice*.

ESTOPPEL, (in Law) signifies as much as an Impediment, or Bar of an Action, growing from his own Fact, that hath, or otherwise might have had this Action.

ESTREAT, in Law, is used for the true Copy or Duplicate of an Original Writing.

For Example, Of Amerciaments or Penalties set down in the Rolls of a Court, to be levied by the Bayliff, or other Officer, of every Man for his Offence.

ESTREPE, in Law, is to make Spoil by a Tenant for Life in Lands, or Woods, to the Prejudice of him in Reversion.

And *Estrepageant* signifies the Spoil made by Tenant for Life upon any Lands or Woods, to the Prejudice of the Reversioner.

ESURINE Salts, are such as are of a corroding, fretting, and eating Nature; they abound in the Air of Places situate near the Sea side, and where great Quantities of Coal are burnt; as appears from the speedy rusting of the Iron-Bars in the Windows, &c. of Houses built in such Places.

ETAPPE, in the Art of War, is the Allowance of Provisions and Forage, which Soldiers have in their March thro' the Kingdom to or from Winter-Quarters. Wherefore the

ETAPPIER, is he that contracts with any Country, or Territory, for furnishing Troops in their March with Provisions and Forage.

ETATE probanda: See *Elate probanda*.

ETCHING, is a way used in making Prints, by drawing with a Needle upon a Copper-plate covered over with a Ground of Wax, &c. and well blacked with the Smoke of a Link, that it may take off the Figure of the Drawing or Print, which having its back-side Tintured with white Lead, will by running over the stricken-out Lines with a *Stiff*, impress the exact Figure on the Black or Red Ground; which Figure is afterwards with Needles, drawn deeper quite thro' the Ground, and all the *Shadows* and *Hatchings* put in; and then a Wax Border being made all round the Plate, there is poured on a sufficient Quantity of well-tempered *Aqua-Fortis*, which insinuating into the Strokes, made by the Needles in the Ground, eats the Figure of the Print or Drawing into the Copper-Plate. There is no certain Time in which this is done, but usually the *Aqua-Fortis* will eat deep enough in about half an Hour. *Brown's Ars Pictoria*.

ETHERIAL Oil, so the Chymists call a very fine or exalted Oil, or rather Spirit that is inflammable; as *Oil of Turpentine*, &c.

ETHICS, is that Art which teaches us to seek out those Rules and Measures of Human Actions, that lead to true Morality and Happiness; and which acquaints us with the Means to practice them.

The Writers upon it usually divide it into two Parts; The First contains an Account of the Nature of Moral Good and Evil. And

The other Enumerates the several Virtues in which the Practice and Exercise of Morality consists; and which are the proper Means for us to obtain true Felicity, the End of all Moral Actions.

ETHMOIDALIS, is a Suture that surrounds a Bone of that Name, and separates it from the Bones which are about it.

ETHMOIDES, is a Bone which resembles a Sieve, placed above the inner part of the Nose, and full of little Holes to receive the Serous and Pituitous Humours from the soft Pappy Processes of the Brain. *Blanchard*.

ETYMOLOGY, is that part of *Grammar*, which teaches the Original of Words, in order the better to distinguish and establish their true Signification.

EVANID, so some call those Colours which are not of very long duration, as those in the Rainbow, in Clouds before and after Sun-set, &c. These also are called *Fantastical* and *Emphatical* Colours; which see.

EVAPORATION, in Chymistry, is when any Liquor is set over a gentle Heat, that the Fire may gently carry off some of the Moisture, and yet not lessen the Quantity of the Matter the Liquor is impregnated with; to *Evaporate* to a *Pellicle*: See *Pellicle*.

EUCHYMIA, is a good Temper of the Blood, or other Juices, or Fluids in an Animal Body.

EUCRASIA, is a good Temper of the Parts of the Body.

EVECTION, or *Libration* of the Moon, is an Inequality in her Motion, by which, at or near the Quarters, she is not in that Line which passeth thro' the Center of the Earth to the Sun, as she is at her Syzygies, or Conjunction and Opposition, but makes an Angle with that Line of 2 Degrees 50 Minutes, according to the Observation of *Tycho* and *Bullialdus*.

The Moon revolving uniformly about her Axis, in a Month's time, makes her Day to be of a Month in length; and her Face always is turned the same way towards the lower *Umbilicus* of her Orbit; and for that Reason, and the Position of the *Umbilicus*, deviates this way and that way a little from the Earth; which is her *Libration* in *Longitude*: But her *Libration* in *Latitude*, is occasioned by the Inclination of the Moon's Axis to the Plane of the Orbit.

EVEN Number, is that which may be divided into two Parts; as 4, 10, 40, &c. are *Even Numbers*, so far as each of them may be divided into two equal Parts.

EVENLY Even, is that which an *Even Number* doth measure by an *Even* one; as 32 is said to be a *Number Evenly Even*, because 8, an *Even Number*, doth Measure it by 4, which is likewise an *Even Number*.

EVENLY Odd, is that which an *Even Number* doth measure by an *Odd* one; as 30, which 2 or 6, *Even Numbers*, do measure by 15 or 5 *Odd Numbers*.

EUEXIA, is a good sound Habit of Body.

EVOLUTION, is used by *Dr. Pell*, and others, for the Extraction of Roots out of any Powers; and so is directly contrary to *Involution*; which see.

EVOLUTION, in *Tactics*, is the Motion made by a Body of Men in changing their Posture, or Form of drawing up; either to make good the Ground they are upon, or to possess themselves of another; that so they may attack the Enemy, or receive his Onset more advantageously: And these *Evolutions*, are *Doubling of Ranks*, or of *Files*, *Countermarches*, and *Wheelings*.

EUEPSIA, a good and easy Digestion.

EUPHORIA, is the well-bearing of the Operation of a Medicine; that is, when the Sick Person finds himself eas'd or reliev'd by it; then they say it wrought upon the Patient *cum Euphoria*.

EUPNOEA, is a right natural Respiration.

EUPORIA, is an easy Preparation of Medicines, or the easiness of their Operation. *Blanchard*.

EURYTHMY, in Architecture, signifies the exact Proportion between all the Parts of a Building.

EUSARCOS, is one that is well fleshed. *Blanchard*.

EUSTOMACHUS, is a good Stomach; as also Meat convenient for it.

EUSTYLE, in Architecture, is a kind of Edifice where the Pillars are placed at a most convenient distance one from another; the *Intercolumniations* being all just two Diameters and a quarter of the Pillar, except those in the middle of the Face before and behind, which are in distance three Diameters.

EUTHANASIA, is a soft quiet Death, or an easy Passage out of this World.

EUTROPHIA, is a due Nourishment of the Body.

EXACERBATIO: See *Paroxysmus*.

EXACTION, in Law, is a Wrong done by an Officer or one pretending to have Authority in taking a Reward or Fee for that which the Law allows not. The Difference between *Exaction* and *Extortion* is this:

Extortion, is where an Officer extorts more than his Due.

Exaction, is where he wrests a Fee or Reward where none is due.

EXÆRESIS, is an Extraction of things out of the Body, that are hurtful to it.

EXAGOON, the same with *Hexagon*.

EXAMINERS in *Chancery*, are two Officers that *Examine*, upon Oath, Witnesses produced on either side, upon such Interrogatories as the Parties to any Suit do exhibit to that purpose; and sometimes the Parties themselves are by particular order examined also by them.

EXANASTOMOSIS, is an opening of the Extremity of the Vessels. *Blanchard*.

EXANTHEMA, is a certain Efflorescence upon the Skin of the Head, like those which appear in the Skin of the whole Body. It is described two ways by *Sennertus*; one is, that at least it changes the colour of the Skin, as in continued malignant Fevers, wherein the Skin is spotted as with Flea-bites; the other is, when certain little Swellings break out of the Skin, which may be call'd *Papilla*. *Blanchard*.

EXARTHREMA, the same with *Luxatio*.

EXARTICULATION: See *Dislocation*.

EXCENTRICK, the same with *Eccentrick*.

EXCEPTIO, is the incorporation or mixture of dry Powders with some Moisture or other. Thus Electuaries are made, Powders and Pulps are mixt with Honey or Syrup; and the Powder of Pills with Syrup, Honey, Wine or Juice.

EXCEPTIVE Propositions, are those where a Thing is affirmed of the whole Subject, except some one of the Inferiors of the Subject, by adding a Particle of Exception, which denotes that what is predicated does not agree with that Inferior, which visibly includes two Judgments, and renders those Propositions compos'd in Sense. As if one should say, None of the Sects of the ancient Philosophers, except that of the *Platonic*, have acknowledged God to be Incorporeal. The Covetous Man does nothing well, but when he dies.

EXCHANGE, in Common Law, is as much as *Permutation* with the *Civilians*. It hath a peculiar Signification, and is used for that Compensation which the Warranter must make to the Warrantee, Value for Value, if the Land warranted be recovered from the Warrantee.

EXCHEQUER, is the Court or Place to which are brought all the Revenues belonging to the Crown.

This Court consists, as it were, of two Parts, whereof one dealeth Specially, in the hearing and deciding of all Causes appertaining to the Prince's Coffers; The other is called, *The Receipt of the Exchequer*, which is properly employ'd in the receiving and paying Money. It is also a Court of Record, wherein all Causes touching the Revenues of the Crown are handled.

EXCISION, the cutting out, or cutting off of any part of the Body.

EXCLAMATION, is a violent Extension of the Voice, when the Mind comes to be disturbed and agitated with some furious Impulse or Passion.

EXCLUSIVE Propositions, are those which denote, that a Predicate so agrees with its Subject, as to agree with that alone, and no other: Whence it follows, that they include two various Judgments,

and by consequence are compos'd in Sense. Which is express'd by the Word (*only*) or some such like Words: Thus, *Virtue only makes Nobility, nothing else renders a Man truly Noble*.

EXCOMMUNICATO Capiendo, is a Writ directed to the Sheriff, for the Apprehension of him who standeth obstinately excommunicated Forty Days; for such a one not seeking Absolution, hath, or may have, his Contempt certified into the *Chancery*; whence issueth this Writ for the laying of him up without Bail or Mainprise, until he conform himself.

EXCOMMUNICATO Deliberando, is a Writ to the under Sheriff, for the Delivery of an Excommunicate Person out of Prison, upon Certificate of the Ordinary of his Conformity to the Jurisdiction Ecclesiastical.

EXCOMMUNICATO Recipiendo, is a Writ whereby Persons excommunicated being for their Obstinacy committed to Prison, and unlawfully delivered thence before they have given Caution to obey the Authority of the Church, are commanded to be sought for, and laid up again.

EXCORIATION, is when the Skin is rubb'd or torn off, or fretted away from any part of the Flesh.

EXCORTICATION: See *Decortication*.

EXCREMENTS, of an Animal Body, are whatsoever is separated from the Aliments after Concoction, and is to be thrown out of the Body; as the Moisture of the Mouth, Spittle, Snot, Milk, Bile, Sweat, the Wax of the Ears, the Excrements of the Belly and Bladder. *Blanchard*.

EXCRESCENCE, any sort of Swelling; and more particularly a Fleishy Tumour.

EXCRETION, the separating of Excrements or Excrementitious Humours from the Aliments and Blood.

EXECUTION, in Common Law, signifies the last Performance of an Act: As of a *Fine*, or of a *Judgment*; that of a *Fine*, is the obtaining Possession actually of things contained in the same by virtue thereof, which is either by Entry into the Lands, or by Writ.

There are two sorts of *Executions*, one *Final*, another with a *Quousque* tending to an End.

An *Execution Final*, is that which maketh Money of the Defendant's Goods, or extendeth his Lands, and delivereth them to the Plaintiff; for this the Party accepteth in Satisfaction, and this is the End of the Suit, and all that the King's Writ commandeth to be done.

The other Sort with a *Quousque* is tending to an End, and not Final, as in the Case of a *Capias ad Satisfaciendum*, &c. This is not Final, but the Body of the Party is to be taken, to the intent and purpose to satisfy the Defendant; and his Imprisonment is not absolute, but until the Defendant do satisfy: So that the Body is but a Pledge for the Debt.

EXECUTIONE facienda, is a Writ commanding Execution of a Judgment.

EXECUTIONE facienda in Withernamum, is a Writ that lieth for the taking of his Cattle, who formerly hath convey'd out of the Country the Cattle of another; so that the Bayliff having Authority from the Sheriff to replevy the Cattle so convey'd away, could not execute his Charge.

EXECUTOR, is he that is appointed by any Man in his Last Will and Testament, to have the disposing of all his Substance, according to the Contents of the said Will. This *Executor* is either *Particular* or *Universal*: *Particular*, as if this or that

thing only be committed to his Charge: *Universal*, if all.

EXECUTOR *de son tort*, is he that takes upon him the Office of an *Executor* by Intrusion, not being so constituted by the Testator, nor for want thereof appointed by the Ordinary to Administer.

EXEGESIS *Numeroſa aut Linealis*, is the Numeral or Lineal Solution or Extraction of Roots out of *Aſſected Equations* in Algebra, firſt invented by *Vieta*. *Ozanam* calls it *La Rhetique*. Of this you have a very good Account by the Famous *Mr. Collins*, in *Phil. Transf. N. 46*.

EXEMPLIFICATION of *Letters Patents*, is a Copy or Duplicate of *Letters Patents*, made from the Inrollment thereof, and ſealed with the Great Seal of *England*; which *Exemplifications* are as effectual to be ſued or pleaded as the Originals themſelves.

Note, That nothing but Matter of Record ought to be *Exemplified*.

EXEMPLIFICATIONE, is a Writ granted for the Exemplification of an Original.

EX gravi Querela, is a Writ that lieth for him to whom any Lands or Tenements in Fee within a City, Town, or Borough, being deviable, are deviſed by Will, and the Heir of the Deviſor entred into them, and detaineth them from him.

EXHALATION, is whatever is raiſed up from the Surface of the Earth or Water by Means of the Heat of the Sun, that of the Subterraneous Fire, &c. ſuch as Vapours, Miſts, Fogs, &c.

EXHAUSTED Receiver, is that Body or Veſſel of Glaſs, &c. which hath the Air drawn out of it by *Mr. Boyle's*, or any other Engine for that purpoſe; and which, tho' not containing an abſolute Vacuum, ſeems to be empty of all true Elastiſtick Air, and therefore is, properly ſpeaking, *Exhausted* of Air.

EXHAUSTIONS, a Term in Mathematicks, where they have what they call, *The Method of Exhaustions*, of frequent Uſe in the Ancient Mathematicians, ſuch as *Euclid*, *Archimedes*, &c. This is founded on what *Euclid* ſaith in his Tenth Book, viz. *That thoſe Quantities whoſe Difference is leſs than any aſſignable, are equal*; for if they were unequal, be the Difference never ſo ſmall, yet it may be ſo multiplied, as to become greater than either of them; if not ſo, then it is really nothing. This he aſſumes in the Proof of the firſt Prop. of Book 10. which is, *That if from the greater of two Quantities you take more than its Half, and from the Remainder more than its Half, and ſo continually, there will at length remain a Quantity leſs than either of thoſe propoſed*.

On this Foundation they demonſtrate, That if a Regular Polygon of infinite Sides be inſcribed in, or circumscribed about a Circle, the Space that is the Difference between the Circle and the Polygon will, by degrees, be quite exhausted, and the Circle equal to the Polygon: *Vid. Archimed. de Dimensione Circuli*. *Wallis's Algebra*, P. 280. *Pardie's Elements of Geometry*, Book 4. Prop. 28.

EXHIBIT, in Law, is when a Deed, Acquittance, or other Writing, is in a Chancery Suit exhibited to be proved by Witneſs; and the Examiner writes on the back, That it was ſhewed to ſuch a one at the ſame time of his Examination: This is there call'd *An Exhibit*.

EXIGENDARY: See *Exigenter*.

EXIGENT, is a Writ that lieth where the Defendant in an Action Perſonal cannot be found, nor any thing within the County whereby he may be

Attached or Distrained; and is directed to the Sheriff, to proclaim and call five County Days one after another, charging him to appear under the pain of Outlawry. This Writ lieth alſo in an Indictment of Felony, where the Party indicted cannot be found.

EXIGENTER, is an Officer in the Court of *Common Pleas*, whereof there are Four. They make all Exigents and Proclamations in all Actions where Proceſs of Outlawry doth lie, and Writs of *Superſedeas*, as well as the *Protonotaries* upon ſuch Exigents as were made in their Offices. But making Writs of *Superſedeas* is now taken from them by an Officer in the ſame Court.

EX Mero motu, are Words formerly uſed in any Charter of the Prince, whereby he ſignifieth, That he doth that which is contained in the Charter, of his own Will and Motion, without Petition or Suggeſtion made by any other; and the Effect of theſe Words, are to bar all Exceptions that might be taken unto the Inſtrument wherein they be contained, by alledging, That the Prince in paſſing that Charter, was abuſed by any falſe Suggeſtion.

EXOMPHALOS, is a Protuberance of the Navel, common to Infants.

EXONERATIONE Seſſe, is a Writ that lieth for a King's Ward to be diſburthened of all Suit, &c. to the County, Hundred, Leet, or Court-Baron, during the time of his Wardſhip.

EXOPHTHALMIA, is a Protuberance of the Eye, out of its natural poſition.

EXOSTOSIS, is a Protuberance of the Bones out of their natural place.

EXPANSION. *Mr. Lock* ſaith this Word expreſſes the Idea which we have of *Laſting Diſtance*, all whoſe parts exiſt together, which is a Metaphyſical Notion of the Word. What is meant by it in a Phyſical Senſe, you will in part ſee under *Exploſion*. Tho' *Expansion*, among Naturaliſts, is often taken alſo for the ſwelling or increaſe of the apparent Bulk of the Fluids when agitated by Heat. And the Quantity of this, in ſeveral Inſtances, *Mr. Halley* gives in *Philof. Transf. N. 197*. where he ſhews, That by Experiment Water was found by him to expand it ſelf one 26th part of its Bulk when it was made to boil, but hardly would it expand at all by a moderate Heat.

But *Mercury* did with a very gentle Heat expand it ſelf one 74th part of its uſual bulk when cold.

Spirit of Wine, with an Heat (at higheſt) that was much leſs than that of boiling Water, expanded it ſelf gradually till it had increaſed to a 12th part of its bulk when cold, and then fell a boiling and emitting Bubbles copiouſly.

There is alſo an *Expansion* of Water made by freezing, which *Mr. Boyle*, in his Book of Cold, tells us, he found to be about $\frac{1}{12}$ part of a Space more than the Water uſually takes up.

The Law of the *Expansion* of Air is this, *That the Spaces unto which Air of a given Quantity is compreſſed, are reciprocally proportionable to the compreſſing Weights*. *Philof. Transf. N. 13*. Whence *Dr. Gregory* proves, *Aſtron. P. 407*. That a Globe of Air of but one Inch in Diameter, if it had ſo great an *Expansion* as it will have at a Semidiameter's Diſtance of the Earth from it, will fill all the Planetary Regions, as far as, and far beyond the Sphere of *Saturn*.

EX PARTE talis, is a Writ that lyeth for a Bayliff or Receiver, that having Auditors aſſigned to hear his Account, cannot obtain of them reaſonable Allowances, but is caſt into Priſon by them. The manner in this caſe, is to take this Writ out of the *Chancery*, directed to the Sheriff, to take the four Mainpennors,

pernors, to bring his Body before the Barons of the *Exchequer*, at a Day certain, and to warn the Lord to appear at the same time.

EXPECTANT, Fee, in Common Law, signifies Land given to a Man, and to the Heirs of his Body, the Remainder to him and his Heirs: Here is a Fee-simple Expectant after the Estate Tayle.

EXPENSIS militum levandis, is a Writ directed to the Sheriff, for levying the Allowance for Knights in Parliament.

EXPENSIS militum non levandis ab hominibus de dominico, nec à Nativis, is a Writ to prohibit the Sheriff from levying any Allowance for the Knights of the Shire, upon those that hold in ancient Demefne, &c.

EXPECTORATION, the raising and casting forth of Phlegm, or other Matter, out of the Lungs.

EXPERIMENTUM Crucis, is such an Experiment, as like a Cross set up where divers ways meet, to direct Travellers in their true Course, guides and directs Men into the true Knowledge of the Nature of the Thing they enquire after.

EXPIRATION, is an alternate Contraction of the Chest, whereby the Air, together with fuliginous Vapours, is expelled by the Wind-pipe.

EXPLOSION, properly signifies a Hissing off the Stage, but by Naturalists an Action of the Animal Spirits, whereby the Nerves are suddenly contracted; the Reason is, That some *Heterogeneous Particles* are mixed with the Animal Spirits, by which they are violently expanded and driven into a Confusion, like the parts of fired Gunpowder. That violent Effervescence, Ebullition and Expansion which arises from the mixture of some contrary Liquors, is called *Explosion*, of which Mr. Boyle gives several Experiments at the End of his Experiments about Flame and Air; as when Spirit of Nitre and Spirit of Wine, Oil of Vitriol and Oil of Turpentine, and when Oil of Vitriol and Sal Armoniac are mingled together.

EXPONENT of the Ratio, or Proportion between any two Numbers or Quantities, is the Quotient arising when the Antecedent is divided by the Consequent. Thus 6 is the Exponent of the Ratio which 30 hath to 5. Also a Rank of Numbers in Arithmetical Progression, beginning from 0, and placed over a Rank of Numbers in Geometrical Progression, are called *Indices*, or *Exponents*: And in this is founded all the Reason and Demonstration of *Logarithms*; for *Addition* and *Subtraction* of these Exponents, answers to Multiplication and Division in the Geometrical Numbers, as you will find more at large in the Word *Logarithm*.

EXPRESSION, in Chymistry or Pharmacy, is the Term for the Action of pressing out the Juices or Oils of Vegetables; and thus Oils so made, are called Oils by *Expression*; as those made by Fire are called Stillitious Oils.

EXPREST Oils, are those that are prepared by squeezing out the oily Juice of Fruits or Seeds; such as Oil Olive, Oil of Sweet and Bitter Almonds.

EXTASY, is a Deprivation of the Judgment and Imagination, familiar to Mad and Melancholy Persons.

EXTENDI facias, is a Writ commonly called, *A Writ of Extent*, whereby the Value of the Land, &c. is commanded to be made and levied in divers Cases.

EXTENSOR Carpi Radialis, is a Muscle of the Wrist, by some called *Bicornis* and *Radius externus*. It has two Beginnings, and indeed seems to be two distinct Muscles, the outermost arising fleshy above the external Portuberance of the *Os Humeri*, immedi-

ately below the *Sapinator Radii Longus*, in its descent becomes a fleshy Belly, and grows Tendinous above the middle of the *Radius*. The other Beginning of this Muscle is partly Fleshy and partly Tendinous below the former, either from the *Apex* of the Extuberance of the *Os Humeri* or superior part of the *Radius*, and continues Fleshy somewhat lower than the Superior, both Tendons marching under the *Entensores Pollicis*, run under the *Ligamentum Annulare*, and are inserted to the superior parts of the *Osse metacarpi* of the Fore and Middle Fingers.

EXTENSOR Carpi Ulnaris, is a Muscle of the Wrist, which hath an acute tendinous Beginning from the outward Extuberance of the *Os Humeri*, and becomes Fleshy as it descendeth, according to the Length of the *Cubit*, growing Tendinous again as it marcheth over the inferior part of the *Ulna*; and passing under the Annular Ligament, it is inserted to the superior part of the Metacarpal Bone of the Little Finger. If this Muscle and the *Ulnaris Flexor* act, they move the Hand sideways towards the *Ulna*; and in like manner, if the *Radialis Flexor* and *Extensor* act, they move it towards the *Radius*.

EXTENSOR Digitorum Communis, seu Digitorum Tensor, is a Muscle of the Fingers, which has an acute tendinous Origination from the outward Extuberance of the *Os Humeri* between the *Extensores Carpi*, becoming Fleshy in less than half its progress. It is divided into three portions, which become so many Tendons, (of which the Middlemost is the longest) passing under their Annular Ligaments between the lowest parts of the *Ulna* and *Radius*, march separately over the *Dorsum Manus*, and remitting tendinous Filaments to each other as they pass the first Internodes of each Finger, and are afterwards inserted to the superior parts of the first, second, and third Bones of the four, middle, and third Fingers.

There being no Force required in the Extension of the Fingers, we need not wonder that the Muscles employ'd in that Office, are no larger in proportion to their Antagonists.

EXTENSOR Indicis, seu Indicator, is a Muscle of the Fingers, which arises fleshy from the middle of the external part of the *Ulna*, next the *Radius*, immediately below the *Extensores Pollicis*, and descending obliquely, becomes Tendinous as it passes under the Annular Ligament at the lower part of the *Radius* and *Carpus*, passing over the *Os Metacarpi Indicis*, and joining with the Tendon of the *Extensor Communis*, is inserted with it to the superior part of the third Bone of the Fore Finger. The Tendon of it is sometimes divided. Its Name declares its Use, which is to extend the Fore Finger.

EXTENSOR primi Internodii Pollicis, is a Muscle of the Thumb which arises Tendinous from the upper part of the *Ulna*, immediately below the *Sapinator Radii brevis*, soon growing Fleshy, and becomes Tendinous again as it descends obliquely over the Tendons of the *Radialis Extensor*, and is inserted to the superior part of the first Bone of the Thumb. This is divided into two, and sometimes into three distinct Muscles.

EXTENSOR Secundi Internodii Offis Pollicis, is a Muscle of the Thumb, which arises broad and fleshy from that part of the *Radius* next the *Ulna*, and becoming Tendinous, passes under the same *Involucrum* with the Tendons of the *Extensor primi*, &c. to its Implantation of the superior part of the second Bone to the Thumb.

EXTENSOR tertii Internodii Offis Pollicis, is a Muscle of the Thumb, which has a broad, partly

tendinous, but chiefly fleshy Origination from the *Ulna*, immediately below the beginning of the *Extensor primi Internodii*, or between it and the Indicator; as also from the Ligament between the last named Bone and the *Radius*, whence descending obliquely, becoming Tendinous as it marches in a proper *Sinus* on the inferior *Appendix* of the *Radius*, wherein it's enclosed by its Annular Ligament, and passes over the two Tendons of the *Radialis extensor*, to its Insertion at the superior part of the third Bone of the Thumb. When this acts, it does not only extend the Thumb, but brings it somewhat backwards, insomuch that some Persons can place it on the superior and back part of the *Ossa Metacarpi*.

EXTENSOR minimi digiti, is a Muscle which arises partly Tendinous at the Extremitie of the external *Apophysis* of the *Os Humeri*; and partly Fleshy from the superior part of the *Ulna*, between the *Extensor Communis Digitorum*, and *Musculi Ulnaris Extensor*, and becoming Tendinous as it passes under the *Ligamentum Annulare* at the *Carpus*, it is there divided into two, sometimes three Tendons, which are united in one at its Insertion to the superior part of the third Bone of the Little Finger. Its Name declares its Action.

EXTENSOR Pollicis Pedis Brevis, is a Muscle of the great Toe, arising Fleshy from the fore part of the *Os Calcis*, being dilated into a Belly, soon becomes a long slender Tendon, passing obliquely over the upper part of the Foot, and is inserted to the superior part of the second Bone of the great Toe, which it extends or pulls upwards.

EXTENSOR Pollicis Pedis Longus, is a Muscle of the great Toe, which takes its Beginning large and fleshy, from the fore part of the *Fibula*, from immediately below its superior *Appendix*, to four Finger's Breadth above the inferior one, and descending under the *Ligamentum Annulare* of the *Tarsus*, between the Tendon of the *Tibialis Anticus* and those Tendons of *Extensor Pedis Longus*, and marching along the superior part of the Foot, is inserted to the upper part of the second Bone of the Great Toe. Its Name intimates its Use to be, to extend the Toe.

EXTENT, in Law, hath two Significations, sometimes signifying a Writ or Commission to the Sheriff for the valuing of Lands or Tenements; sometimes the Act of the Sheriff upon this Writ. But it frequently signifies the Estimate or Valuation of Lands, when done to the utmost Value, was said to be in the full *Extent*.

EXTERGENT Remedies: See *Abstergent*.

EXTERIOR Polygon: See *Polygon exterior*.

EXTERIOR Talus: See *Talus*.

EXTERNAL Angles: See *Angles external*.

EXTERNUS Auris, vel Luxator externus, is a Muscle which lies in the upper part of the *Meatus Auditorius*, having a short fleshy Body, with a long slender Tendon. It arises from the external and superior Margin of the *Meatus Auditorius*, soon becoming a slender Tendon, passes directly to the upper part of the *Membrana Tympani*, on which it defends for some space to its Insertion in the long Process of the *Malleus*, where it is contiguous to the said Membrane. This draws the *Manubrium* of the *Malleus*, together with the *Membrana Tympani*, forwards.

EXTIRPATIONE, is a Writ Judicial that lyeth against him, who, after a Verdict found against him for Land, &c. doth maliciously overthrow any House upon it, &c. And 'tis either *ante Judicium*, or *post Judicium*.

EXTINGUISHMENT, in Law, is an Effect

of Consolidation; as if a Man have a Yearly Rent due to him out of any Lands, and afterwards purchase the same Lands; now both the Property and Rent are consolidated or united into one Possessor, and therefore the Rent is said to be *extinguished*. Also, where a Man hath a Lease for Years, and afterwards buyeth the Property; this is a Consolidation of the Property and the Fruits, and is an *Extinguishment* of the Lease. So if a Man have a High-way Appendant, and after purchase the Land whereon the High-way is, then the High-way is *extinct*; and so it is of Common Appendant.

EXTIRPATION, is the cutting off, or out of the Body any Part; tho' cutting off a Part is more properly called *Amputation*.

EXTORTION, a Law Term, signifying an unlawful or violent wringing of Money, or Moneyworth from any Man: As also, the Exaction of unlawful Usury, winning by unlawful Games, and all taking more than is due.

EXTRACT, is that pure, unmix'd, and efficacious Substance, which, by the help of some Liquor, is separated from the duller and more unactive parts of Plants, &c. This Extract is usually of the Consistence of a stiff Electuary. All Extracts of Vegetables are made after the following manner.

Bruise the Body, or powder it grossly, and then let it steep warm a convenient while in some proper Water, as from 12 Hours a Day, &c. according to the Nature of the Plant; at least, let the Liquor just boil, and then press it hot thro' a Cloth; after this evaporate the filtered Liquor to its due Consistence.

Thus are the Extracts of Rhubarb, Gentian, Wormwood, &c. made.

EXTRA Judicial, in Law, is when Judgment is given in a Cause or Case not depending in that Court where such Judgment is given, or wherein the Judge has not Jurisdiction.

EXTRACTION, is a separating of the subtle Part of a mixed Body, from the more gross: For Example, when the Strength of any Medicine is extracted by Spirit of Wine, that which is left after the Evaporation of the *Menstruum*, is called the *Extract*.

EXTRACTION of Roots, in Mathematicks, is the Method of finding out the true Root of any Number of Quantity given: See *Square Root*, *Cube Root*, &c.

In Philos. Trans. N^o. 240. the Ingenious Mr. Abre de Moivre gives the following Method of Extracting the Root of an Infinite Equation.

THEOREM.

If $az + bz^2 + cz^3 + dz^4 + ez^5 + fz^6$,
 $\&c. = gy + hy^2 + iy^3 + ky^4 + ly^5 + my^6$,
 $\&c.$

$$\begin{aligned} \text{Then will } z \text{ be } &= \frac{g}{a} y + \frac{b - bAA}{a^2} y^2 + \\ & \frac{i - 2bAB - cA^3}{a^3} y^3 + \frac{k - bB^2 - 2bAC}{a^4} y^4 + \\ & \frac{-3cA^2B - dA^4}{a^5} y^5 + \frac{l - 2bBC - 2bAD}{a^6} y^6 + \\ & \frac{-3cAB^2 - 3cA^2C - 4dA^3B - eA^5}{a^7} y^7 + \\ & \frac{m - 2bBD - bCC - 2bAE - cB^3}{a^8} y^8 + \\ & \frac{6cABC - 3cA^2D - 6dA^4B^2 - 4dA^3C}{a^9} y^9 + \\ & \frac{-5eA^4B^2 - fA^6}{a^{10}} y^{10}, \&c. \end{aligned}$$

For

For the understanding of this Series, and in order to continue it as far as we please, it is to be observed,

1. That every Capital Letter is equal to the Coefficient of each preceding Term: Thus, the Letter *B* is equal to the Coefficient $\frac{b-bA^2}{a}$.

2. That the Denominator of each Coefficient is always *a*.

3. That the first Member of each Numerator, is always a Coefficient of the Series $gy + by^2 + zy^3$, &c. viz. The first Numerator begins with the Coefficient *g*, the second Numerator with the second Coefficient *b*, and so on.

4. That in every Member after the first, the Sum of the Exponents of the Capital Letters is always equal to the Index of the Power to which this Member belongs: Thus, considering the Coefficient $\frac{k-bB^2-2bAC-3cA^2B-dA^4}{a}$ which

belongs to the Power y^4 , we shall see that in every Member bB^2 , $2bAC$, $3cA^2B$, dA^4 the Sum of the Exponent of the Capital Letters is 4. (Where it may be taken notice of, that by the Exponent of a Letter, is meant the Number which expresses what Place it has in the Alphabet: Thus 4 is the Exponent of the Letter *D*.) Hence is derived this Rule for finding Capital Letters of all the Members that belong to any Power.

Combine the Capital Letters as often as you can make the Sum of the Exponents equal to the Index of the Powers to which they belong.

5. That the Exponents of the same Letters which are written before the Capitals, express how many Capitals there are in each Member.

6. That the Numeral Figures or *Uncie* that occur in these Members, express the Number of Permutations, which the Capital Letters of each Member are capable of.

For the Demonstration of this,

Suppose $z = Ay + By^2 + Cy^3 + Dy^4$, &c. Substitute this Series in the room of *z*, and the Powers of this Series in the room of the Powers of *z*; there will arise a new Series: Then take the Coefficients which belong to the several Powers of *y*, in this new Series, and make them equal to the corresponding Coefficients of the Series $gy + by^2 + zy^3$, &c. and the Coefficients *A*, *B*, *C*, *D*, &c. will be found much as is determined in the *Theorem*.

This *Theorem* might have been made much more general, by supposing

$az + bz^{\frac{n}{m+2}} + cz^{\frac{n}{m+1}}$ &c. = $g'y + by^{\frac{n}{m+1}}$ + $zy^{\frac{n}{m}}$ &c. Then all the Powers of the Series $Ay + By^2 + Cy^3$, &c. designed by the universal Indices, must have been taken successively.

This *Theorem* may be applied to what is called the *Reversion of Series*; such as finding the *Number* from its *Logarithm* given; the *Sine* from its *Ark*; the *Ordinate* of an *Ellipsis* from an *Area*, given to be cut from any Point in the *Axis*.

But to make a particular Application of it, we'll suppose this Problem was to be solved, viz. The

Chord of an *Ark* being given, to find the Chord of another *Ark* that shall be to the first as *n* to 1.

Let *y* be the Chord given, *z* the Chord required;

Now the *Ark* belonging to the Chord *y*, is $y + \frac{y^3}{6d} + \frac{3y^5}{40d^3} + \frac{y^7}{112d^5}$; and the *Ark* belonging to the

Chord *z*, is $Z + \frac{z^3}{6d^2} + \frac{3z^5}{40d^4} + \frac{5z^7}{112d^6}$, &c.

The first of these *Arks* is to the 2d, as *i* to *n*; therefore multiplying the Extremes and Means together,

we shall have this Equation, $Z + \frac{z^3}{6d^2} + \frac{3z^5}{40d^4} + \frac{5z^7}{112d^6}$, &c. = $ny + \frac{ny^3}{6d^2} + \frac{3ny^5}{40d^4} + \frac{5ny^7}{112d^6}$, &c.

Compare these Two Series with the Two Series of the *Theorem*, and you'll find $a = 1$, $b = 0$, $c = \frac{1}{6d^2}$, $d = 0$, $e = \frac{3}{40d^4}$, $f = 0$, $g = n$, $h = 0$,

$i = \frac{n}{6d^2}$, $k = 0$, $l = \frac{3n}{40d^4}$, $m = 0$, &c.

Hence $z = ny + \frac{n-n^3}{6d^2}y^3$, &c. Or $ny + \frac{1-n^2}{2 \times 3d^2}y^3$, &c. supposing *A* to denote the whole preceding Term, which will be the same Series as Sir *Iaac Newton* has first found.

On the same Method this general Problem may be solved.

The *Abcissa* corresponding to a certain *Area* in any Curve being given, to find the *Abcissa*, whose corresponding *Area* shall be to the first in a given Ratio.

The *Logarithmetick Series* might also be found, without borrowing any other Idea, than that *Logarithms* are the *Indices of Powers*.

Let the Number, whose *Logarithm* we imagine, be $1 + z$; suppose its *Logarithm* to be $az + bz^2 + cz^3$, &c.

Let there be another Number $1 + y$: Therefore its *Logarithm* will be $ay + by^2 + cy^3$, &c.

Now if $1 + 2 = 1 + y$, it follows, That $az + bz^2 + cz^3$, &c. : $ay + by^2 + cy^3$, &c. :: *n* : 1.

That is, $az + bz^2 + cz^3$, &c. = $nay + nby^2 + ncy^3$, &c.

Therefore we may find the Value of *z*, express by the Powers of *y*.

Again, since $1 + z = 1 + y$; therefore $z = 1 + y - 1$.

That is, $z = ny + \frac{n}{1} \times \frac{n-1}{2}y^2 + \frac{n}{1} \times \frac{n-1}{2} \times \frac{n-2}{3}y^3$, &c.

Therefore *z* is doubly express by the Power of *y*: Compare these Two Values together, and the Coefficients *a*, *b*, *c*, &c. will be determined, except the first (*a*) which may be taken at Pleasure, and gives accordingly all the different Species of *Logarithms*.

The following Converging Series for the Extracting of the Roots of all Equations, whether Simple or Adjected, the late Mr. Wastell of the Navy-Office sent me, and desired me to Publish.

Let $\begin{cases} A = \text{to any Absolute Number.} \\ N = \text{to any Number assumed.} \\ n = \text{to the Exponent of any Power.} \\ p, q, r, s, \&c. \text{ the several Coefficients in any Equation.} \end{cases}$

Then, in any Equation, it will be

$$\pm 1 \times x^n \pm p \times x^{n-1} \pm q \times x^{n-2} \pm r \times x^{n-3} \pm s, \&c. = A$$

And we have universally,

$$x = \frac{A + 1 \times n - 1 N^{n-1} \pm p \times n - 2 N^{n-2} \pm q \times n - 3 N^{n-3} \pm r \times n - 4 N^{n-4} \pm s, \&c.}{\pm 1 \times N^{n-1} \pm p \times n - 1 N^{n-2} \pm q \times n - 2 N^{n-3} \pm r \times n - 3 N^{n-4} \pm s, \&c.}$$

In which Series observe,

- I. That the same Sign in the given Equation, must be in the Theorem or Series respectively.
- II. Any Term which is wanting in the Equation, must be omitted in the Series.
- III. The Quotient at every Operation must be made a new N .
- IV. That it terminates in the Root, or falls into a Series, if it be a *Surd*.
- V. Such Series will be produced (in Number of Places) by a Geometrical Progression from Unity; (whose Ratio is two) each Operation.
- VI. The nearer N is taken to the true Root, the sooner it will converge to it.

And in his Edition of *Parson's Arithmetick*, Book 2. Chap. 21. you may see a further Account of this Series, and the same exemplified in Numbers.

EXTRAMUNDANE Space, is the infinite, empty, void Space, which is by some supposed to be extended beyond the Bounds of the Universe, and consequently, in which there is really nothing at all.

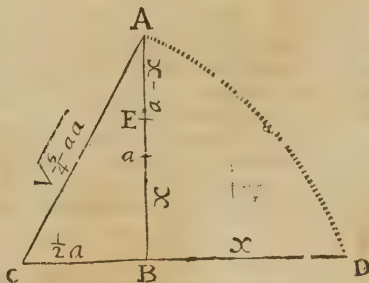
EXTRAVASATED, in Anatomy, is whatever is put or let forth out of the Vessels, as Blood out of the Veins or Arteries, into the Cavities of the Body, &c.

EXTREME and mean Proportion, in Geometry, is when a Line is so divided, that the whole Line is to the greater Segment, as that Segment is to the other.

Or, as *Euclid* expresses it, when 'tis so divided, that the Rectangle under the whole Line, and the lesser Segment, shall be equal to the Square of the greater Segment.

The Invention whereof is as follows.

Let the given Line be $AB = a$, and for the greater Segment put x ; the lesser will be $a - x$.



Then by the Hypothesis

$$a : x :: a - x ::$$

Therefore $a a - a x = x x$, consequently $a a = x x + a x$.

And by adding $\frac{1}{4} a a$ on each Side, to make $x x + a x + \frac{1}{4} a a$ a complete Square,

The Equation will stand thus;

$$\frac{5}{4} a a = x x + x a + \frac{1}{4} a a$$

Now

Now since the latter is exactly a Square, its Root $x + \frac{1}{2}a = \sqrt{\frac{1}{4}aa}$; and by Transposition it will be $\sqrt{\frac{1}{4}aa} - \frac{1}{2}a = x$; which last Equation is a Canon to find x .

For at the Foot of $AB = a$, set at Right Angles $CB = \frac{1}{2}a$: Then draw CA , the Square of which is equal $AB^2 + CB^2 = \frac{1}{4}aa$. And therefore $AC = \sqrt{\frac{1}{4}aa}$; make $CD = CA$.

From whence $CB = \frac{1}{2}a$ being taken as the Case requires, there remains $BD = x$; which transfer into AB , it shall find the Point E , where AB is cut according to *Extreme and Mean Proportion*.

The Synthetical Demonstration whereof, Euclid gives in the 11. c. 2.

This cannot be done exactly in any Numbers; but if you would have it tolerably near, add together the Square of any Number, and the Square of its half, and extract as near as you can the Square Root of the Sum; from whence taking half the whole Number, the Remainder is the greater Part.

EXTUBERANCES, are Swellings forth, or Risings up in the Flesh, or other Parts of the Body.

EXULCERATION, is a Solution of Continuity, proceeding from some gnawing Matter, and in soft Parts of the Body is attended with a loss of their Quantity; it differs from an Abscess which commonly follows a Crisis.

EXUVIE, the Shells, and other Marine Bodies, which are found every where in the Bowels of the Earth, and which were certainly left there at the Universal Deluge, because they are now proved by Dr. Woodward and others, to be the Real Spoils of once living Animals, and not Stones, or Natural Fossils; he very properly calls them the *Exuvie* of Animals.

EYE, is the wonderful Organ of Sight: The Eyes are placed in two large Cavities, which they call *Orbitæ*, hollowed out of the Bones of the Skull on each Side of the Nose; which *Orbitæ* are invested on their Inside with their *Pericranium*, and to it the Feet and Origines of the Muscles adhere firmly. These are the first containing Part of the Eye; the next are the *Palpebræ*, or Eye-lids; which see under *Palpebra*.

The Eye hath four Tunicles; of which one is called *Common*, and the other Three *Proper*.

The Common Tunicle is called *Adnata*, and this springs from the *Pericranium*, and is spread over all the White of the Eye, above the *Sclerotica*, reaching as far as the *Iris*. By this the Eye is kept firmly within its Orbit, from whence it is also called *conjunctiva*. It is of very exquisite Sense, and has many Capillary Veins and Arteries creeping through it, which are most conspicuous in an Ophthalmia, or Inflammation of the Eye. Under this Tunicle are Tendons of the Muscles extended and expanded to the Circumference of the *Iris*, which increases its Whiteness; and some take them for a second Tunicle, calling it *Innominata*.

The *Proper* Tunicles of the Eye are Three, according to the threefold Substance of the Optick-Nerve. For this Nerve (as all the other) consists of Two Tunicles springing from this, the *Dura* and *Pia Mater*, and an inner Marrowy Substance.

From the *Dura Mater* springeth the utmost Coat of the Nerve; and from the Tunicle that is spread next under the *Adnata*, called *Sclerotica* from its Hardness; but in its fore Part where it covereth the *Iris* and *Pupilla*, it is named *Cornea*, from its tran-

sparency, tho' sometimes this latter Name includes the whole Tunicle, as well behind and on the Sides, as before.

That which lieth next under the *Cornea*, is much thinner than it, and is called *Choroides*, from its resembling the Membrane *Chorion*, wherein the *Fœtus* is included in the Womb. Its forepart is otherwise called *Uvea*, because it is somewhat of the Colour of a Grape. This springs from the *Pia Mater*, and is spread from the Bottom or Center of the Eye behind, all over the Eye to the *Pupilla*; to whose Circumference when it is come, it becomes double, making with one Part the *Iris*, with the other the *Ligamentum ciliare*.

On the Inside it is of a dusky Colour (in Man) but blacker on the Outside. But where it makes the *Iris*, it is of divers Colours, resembling the Rainbow, from whence it borrows its Name: Yet in some it is more Blue, in others Black, in others Grey.

This Tunicle is perforated before as wide as the *Pupilla* (or Sight of the Eye) to permit the Rays of visible Species to pass into the Crystalline Humour.

Next unto which Crystalline Humour lies the *Ligamentum ciliare*, the second Part of the duplicated *Uvea*. This consists of slender Filaments, or Fibres (like the Hairs of the Eye-lids) running like so many Black Lines from the Circumference of the *Uvea* to the Sides of the Crystalline Humour, which they encompass and widen, or constringe as there is Occasion, by contracting or opening the *Foramen* of the *Uvea*.

The third Tunicle is made of the Medullar Substance of the Optick Nerve, and is called *Retina*, or *Retiformis* (Net-like;) This seemeth to be the principal Organ of Sight. For as Dr. Briggs well argues, neither the Crystalline Humour, through which the Rays pass much refracted, nor the Tunicle *Choroides*, are at all fit for this Use: For this latter Part (as rising from the *Pia Mater*) cannot communicate the Impressions of the Rays to the Medullar Part of the Brain, which it does not at all touch: Whereas the Medullar Fibres of the *Retina* have Communication therewith, as springing therefrom, and therefore can well perform that Office. The Fibres of this Tunicle are extended from the Bottom or inner Center of the Eye, where the Optick Nerve enters it, as far as the *Ligamentum ciliare*, (to which it affords Animal Spirits for the Continuance of its Motion.) If one take this *Tunica Retina*, and put it into warm Water, shaking it a little, to wash off the mucous Substance that cleaves to it, and then hold it up to the Light, these Filaments will appear very numerous, like the Threads of the finest Lawn.

Next to the Tunicles of the Eyes, are the Humours contained in them to be considered; and these are in Number Three, viz. *Aqueus*, *Crystallinus*, and *Vitreus*. The second weighs as much again as the first, and yet not so much as the third by a sixth Part. The Crystalline is the most dense of Consistence by much; and the Glassy more dense than the Watry.

The *Aqueous* Humour is outermost, being pellucid and of no Colour (as neither are the other Two.) It fills up that Space that is betwixt the *Cornea* and the Crystalline Humour before. If any thickish Particles swim in it, then Gnats, Flies, Spiders-Webs, and the like, will seem to be flying before the Eyes: But if those Particles grow still thicker, and close together, so as to make a Film, and this be spread before the Hole of the *Pupilla*, then is the Sight quite taken away, which Disease is call'd a *Cataract*.

This Humour is very clear and thin, and therefore easily diffusable; but by which way its Expence should be supplied, is difficult to determine. Some think it is fed by the Arteries, out of which this Water issues through I know not what Glands; others derive it from the Nerves, and a third Sort from the Lympheducts.

But Dr. *Anthony Nuck* refutes all these Opinions.

The first, from the Non-appearance of any Glands.

The second, from the no (or at the most a very small quantity of) Liquor that at any time can be observed in the Nerves; whereas if the *Tunica cornea* be prick'd, and all or the greatest Part of this Aqueous Humour be let out, he has found by repeated Experiments, that it will be recruited again in Six Hours Space.

The third Opinion he refutes from the general Office of Lympheducts; which is, to bring back from the Circumference to the Center, and not contrarily, because the Valves wherewith they every where abound, cannot admit of that Motion. Wherefore exploding all these Opinions, he establishes a new one of his own, upon the Score of the new Vessels that he has observ'd to terminate in the *Tunica cornea*, (which he calls *Ductus Oculorum aquosi*, which we shall describe from him by and by) affirming, That these Ducts are the Conduits by which this Humour is fed; and that they supply it ordinarily with several Drops daily, because of the continual Transpiration of it, by Pores looking from within outwards. As to the Particles of this Humour, from several Experiments he has made, he thinks it is demonstrable:

1. That it contains in it a very limpid and pellucid Water.
2. Viscid and Tenacious Particles.
3. A Salt and an Acid.
4. Earthy Particles.
5. That it wants not also its Volatile Spirit.

The *Crystalline Humour* (so called from its being as clearly transparent as Crystal) is placed betwixt the Aqueous and the Vitreous, but not exactly in the Middle or Center of the Eye, but rather towards its Fore-part. It is inclosed in the Bosom, as it were, of the Vitreous Humour, and is flattish on the Fore-side, but rounder behind. It is more bright and thick than either of the other two.

It has been the common Opinion, That it has been inclosed in a proper Membrane, which is called either *Crystallina* from its Transparency, or *Aranea* from its most fine Texture. But Dr. *Briggs*, a very accurate Anatomizer of the Eye, denies any such Tunicle, affirming, That it is merely adventitious when the Humour is exposed for some time to the Air, or is gently boil'd.

As to the Collection or Reception of the Rays of things visible, this Humour is the primary Instrument of Sight; tho', as was said before, the *Tunica Retina* is the Principal as to Perception, because

through it the Rays are communicated to the common Sensory.

The Third and last Humour of the Eye is the *Vitreous*, so called, because it is the like to molten Glass. This is thicker than the Aqueous, but thinner than the Crystalline, and much exceeds them both in Quantity, for it fills up all the inner or hinder Hemisphere of the Globe of the Eye, and a pretty deal towards the lateral Superficies of the former. It is round behind, but hollow in the middle forwards, to receive the Crystalline into its Bosom. This Humour is also said to be separated from the other Two by a proper Tunicle called *Vitreæ*, which the aforesaid Ingenious Author likewise denies.

The Eyes have Arteries from the *Carotides*, which bestow Twigs on their Muscles, and on their Tunicles: and these are accompanied with Veins springing from the Branches of the Jugulars. As for their Nerves, they either assist the Sense of Seeing, and are called the Optick Nerves, which we have reckon'd from the Second Pair; or serve for the moving of them, being inserted into their Muscles; and to this Purpose serve the third and fourth Pair, as some Twigs of the Fifth.

As to the Lympheducts, besides these Vessels, Dr. *Anthony Nuck*, whom we cited but just now, has discovered a fifth Sort of Vessel, called by him, *Ductus oculorum aquosi*, which he believes to recruit the continual Consumption of the watry Humour of the Eye.

He says, They are of an uncertain Number, and may be plainly discern'd to run along the *Tunica Sclerotica*, and to penetrate at length the *Cornea*, where their Orifices have such a Valve as the Ureters have in the Urinary Bladder, or the *Porus bilaris* in the *Vesica fellea*.

In the *Tunica Sclerotica*, and *Cornea*, they are of a dusky Colour, but not before they arrive thereat. They admit of a Probe of a pretty Bigness, and are of a stronger Make than Lympheducts.

He has taken great Pains to trace them to their Origin, but has not yet been able to follow them farther than the Optick Nerve: So that he knows not whether their Rise may be from some Gland not yet discovered, or whether the *Glandula pituitaria* may not send forth some Shoots that constitute these Ducts.

The Action of the Eyes is *Vision*: (See that Word) Which is very well defined by *Diermerbroeck*, viz. That it is a Sense whereby from the various Motion of visible Rays collected in the Crystalline and Vitreous Humours, and darting upon the *Tunica Retina*, the Colours of visible Objects are perceived, with their Site, Distance, Greatness, Figure, and Number; the Medium of which Perception is the Light.

EYE, in a Ship; the Hole wherein the Ring of the Anchor is put into the Shank, is called the *Eye of the Anchor*; and the Compass, or Ring, which is left of the *Strap* to which any *Block* is seized, is called also the *Eye of the Strap*.

EYE, in Architecture, is the middle of the *Volute* of the *Ionick* Chapter, which is cut in the Form of a little Rose.

EYE-LIDS: See *Palpebra*.

FACE, in Architecture, is a flat Member, which hath a great Breadth, and small Projecture; as in Architraves, &c. It is also taken for the Front, or Exterior part of a great Building, which immediately presents it self to view.

FACE of a *Bastion*, or of the *Bulwark*, is the most advanced Part of a Bastion toward the Field, or the Distance comprehended between the Angle of the Shoulder, and the flanked Angle.

FACE of a *Place*, is the Curtain together with the two Flanks raised above it, and the two Faces of the Bastion that look towards one another, and flank'd the Angle of the Tenacle.

FACIES *Hypocratica*, is when the Nostrils are sharp, the Eyes hollow, the Temples low, the Laps of the Ears contracted, and the Lobes inverted, the Skin above the Forehead hard and dry, the Complexion pale, livid, of a leaden Colour, or black, *blanchard*.

FACTITIOUS, signifies made by Art, and is usually taken in opposition to the Word *Natural*: Thus Soap is a factitious Body, or Concrete, made by Art; but *Fullers-Earth* is a natural Concrete, form'd in the Bowels of the Earth by the Author of Nature.

FACTORS: In Multiplication the Multiplicand and Multiplier are often called *Factors*, because they do *Facere Productum*, make or constitute the Product.

FACULÆ, are certain bright or shining Parts, which the Modern Astronomers have sometimes observed upon, or about the Surface of the Sun; but they are but very seldom seen.

FACULTY, in Law, is used for a Privilege or Special Power granted unto a Man by Favour, Indulgence, and Dispensation, to do that which by the Common Law he cannot do.

FACULTY is a Power or Ability to perform any Action. The Ancients usually reckon three sorts of Faculties, *Natural*, *Vital*, and *Animal*; and according to their Doctrine, the

Natural Faculty, is that by which the Body is nourished and augmented, or another like it generated: So that it may be distinguish'd into the three Faculties that perform their Functions of *Nutrition*, *Growth*, and *Generation*: And the first of these was also subdivided into the *Attrahere*, *Retentrix*, *Concoctrix*, and *Expultrix Faculty*.

Vital Faculty, is that which preserves Life in the Body, and performs the Functions of *Pulse* and *Respiration*.

Animal Faculty, is that by which the Soul performs the Functions of *Imagination*, *Reasoning*, *Memory*, *Sense*, and *Motion*.

But these, like most other Distinctions of the Ancient Philosophers, are both useless and ill grounded.

FÆCES: See *Excrements*. 'Tis also taken for the gross Substance that settles after Fermentation, or remains after Distillation.

FAINT, or *Feynt Action*, is as much as *Feigned Action*, viz. such an Action, as though the Words of the Writ be true, yet for certain Causes he hath no Title to recover thereby; whereas in a false Action the Words of the Writ are false.

FAINT Vision: See *Vision*.

FAIT (in Law) a Deed, which is a Writing sealed and delivered, to prove and testify the Agreement of the Parties whose Deed it is; and consists of three principal Points, *Writing*, *Sealing*, and *Delivery*.

By *Writing* is shew'd the Parties Name to the Deed, their Dwelling-places, Degrees, Thing granted, upon what Consideration, the Estate limited, the Time when granted, and whether Simply, or upon Condition, &c.

Sealing, is a further Testimony of their Consents, as appears by these Words, *in witness whereof*, &c. *In cuius rei testimonium*, &c. without which the Deed is insufficient.

Delivery, tho' it be set last, it is not the least; for after a Deed is Written and Sealed, if it be not Delivered, it is to no purpose: And therefore in all Deeds care must be taken, that the *Delivery* be well proved.

FAKE, is one Round or Circle of a Cable quilled up out of the way: The Seamen will ask (as a Cable is veered out) how many *Fakes* there are left, that is, how much is behind unweered out.

FALCATED, the Astronomers say the Moon, or any Planet appears *falcated*, when the enlightened Part appears in the Form of a Sickle, or Reaping-hook; which is while she is moving from the Conjunction to the Opposition, or from New Moon to Full; but from Full to a New again, the enlightened part appears *gibbous*, and the Dark *falcated*.

FALCON: See *Falcon*.

FALCONET: See *Falconet*.

FALL, the Seamen call that part of the Rope of a Tackle which is haled upon, the *Fall*. Also a Ship is said to

FALL off, when being under Sail, she keeps not so near the Wind as she should do. They say also that a Ship hath

FALLS when she is not *Flysb*, but hath Rifings of some Parts of her Decks more than others.

FALLING-SICKNESS: See *Epilepsy*.

FALLOPIAN Tubes, or the *Tuba Fallopiana* in Anatomy, are two slender Vessels situated on each side the *Uterus*, whose use is to afford a Passage to a more subtil part of the *Genitura Masculina* towards the *Ovaria*, to impregnate the Eggs that afterwards are to drop into them from thence; and when they are, as it were, ripen'd, to convey them along their inner Cavity to the *Uterus*.

These *Tube* are about four or five Fingers breadth long, and their Substance is composed of two Membranes which come from the external and internal ones of the Womb; they have the same Arteries, Veins, Nerves, and Lymphatics, as the *Ovaria* have. They take their Name from their first Discoverer *Fallopins*.

FALSE Attack: See *Attack*.

FALSE BRAYE, in Fortification, is a small Mount of Earth four Fathom wide, erected on the Level round the Foot of the Rampart, on that side towards the Field, and separated by its Parapet from the *Berne*, and the Side of the Moat. 'Tis made use of to Fire upon the Enemy, when he is already so far advanced, that you cannot force him back from off the Parapet of the Body of the Place: And also to receive the Ruins which the Cannons make in the Body of the Place.

FALSE Claim, (in Law) is where a Man claims more than his due.

FALSE Imprisonment, is a Trespass committed against a Man, by *imprisoning* him without lawful Cause.

FALSO Judicio, is a Writ that lieth for *false Judgement*, given in the County, Hundred, Court-Baron, or other Courts, being no Courts of Record, be the Plea Real, or Personal.

FALSE Position: See *Position*.

FALSO retorno brevium, is a Writ which lies against the Sheriff, for False returning of Writs.

FALX, in Anatomy, is one of the three Processes made by the doubling of the *Dura Mater*; it rises by a narrow Beginning from the *Crista Galli*, to which it is fastned; and as it approaches the Hinder part of the Head, it grows broader and broader, till it terminate where the *Longitudinal Sinus* ends. It divides the *Cerebrum* into two Hemispheres, near as deep as the *Corpus Callosum*. 'Tis called *Falx* from its resembling a Sickle.

FAMES Canina: See *Gynodes Orexis*.

FANCY: See *Phantasy*, or *Imagination*.

FANTASTICAL Colours, the same with those called *Emphatical*; which see.

FARCIMALIS Tunica, the same with the *Al-lantoides*.

FARTHELL; *Farthelling* is the same with what the Seamen now call *Furl* or *Furling*; which is taking up their Sails and binding them close to the Yards.

FASCIA Lata, vid. *Membranosus Musculus*.

FASCIA, a Term in Architecture, as the *Fascia's* of the Architrave; which are the three Bands of which it is composed.

Vitruvius admits no *Fascia's* in the *Tuscan* or *Doric* Orders; but is not imitated by any in that particular Circumstance.

FASCIAE, in the Planet *Mars*, are certain rows of Spots parallel to the Equator of that Planet, which look like Swathes or Fillets wound round about his Body.

FASCIALIS, a Muscle so called: See *Sartorius*.

FASCIATION, is a binding of Swathes about a Limb that is to be cured.

FASCICULUS: See *Manipulus*.

FASCINES, or *Faggots*, in Fortification, are small Branches of Trees, or Bavin's bound up in Bundles; which being mix'd with Earth, serve to fill up Ditches, to make the Parapets of Trenches, &c. Some of them are dipt in melted Pitch or Tar, and being set on fire, serve to burn the Enemies Lodgments or other Works.

FASHION-PIECES, are those two Timbers which describe the Breadth of the Ship at the Stern, and are the outermost Timbers of the Stern, on each side, except aloft, where the Counters are.

FASTIDIUM Cibi, the same with *Anorexia*.

FASTIGIUM, the same with *Fronton*; which see.

FATT of Animals, the learned Dr. *Grew* takes to be a curdling or coagulating of the Oily Parts of the Blood, either by some of its own Saline Parts; or by the Nitrous Parts of the Air mingled therewith: And hence it is, that some Animals, as Conies, and Field-Hares, grow fat in Frosty Weather, the Oily Parts of the Blood being then ordinarily coagulated with a greater Abundance of Nitrous Parts received from the Air into their Bodies; and for the same Reason it is, that the Fat of Land Animals is hard; whereas that of Fishes is soft, and runs all to Oil, because the Water in which they live, hath but few Nitrous Parts in it, in comparison of Air.

And that which induced him to make these Conclusions, was this Experiment:

He took Oil-Olive, and poured upon it highly rectified Spirit of Nitre, and then digested them together for some Days: By degrees the Oil became of the Colour and Consistence of Marrow, and at last *congealed*, or hardened into a white Fat or Butter, which would dissolve only by the Fire like the Fat of Animals: And he observed, that this Oil hardened into Fat most, upon the Exhalation of some of the Sulphureous Parts of the Spirit of Nitre; which Exhalation was effected by unstopping the Glass, after some time of Digestion, and suffering the Oil to dissolve and thicken divers times by successive Heat and Cold. And from hence he infers, That the *true congealing Principle*, is a Spirit of Nitre separated from its Sulphur: And he says, If we would get this, we might congeal Water in the midst of Summer. *Power of Mixture*, Lett. 1. p. 233.

FAT, in the Sea Phrase, is the same with Broad. Thus, if the *Trussing in*, or *Tuck* of a Ships Quarter under Water be deep, they say the hath a *Fat Quarter*.

FACUS and *Frumen*, the same that *Pharynx*.

FAUCON, a sort of Cannon, whose Diameter at the Bore is $5\frac{1}{4}$ Inches, Weight 750 Pound, Length 7 Foot, Load $2\frac{1}{4}$ Pound, Shot $2\frac{1}{2}$ Diameter, and $2\frac{1}{2}$ Weight.

FAUCONET, a sort of Ordnance, whose Diameter at the Bore is $4\frac{1}{2}$ Inches, Weight 400 Pounds, Length 6 Foot, Load $1\frac{1}{2}$ Pound, Shot something more than two Inches Diameter, and $1\frac{1}{4}$ Pound weight.

FAVUS: See in *Achor*.

FAYLING of Record, is when an Action is brought against one who pleads any Matter or Record, and avers to prove it by Record; and the Plaintiff saith, *Nul tiel Record*, whereupon the Defendant hath a Day given him to bring it in, at which Day he fails, or brings in such a one as is no bar to this Action; this is said to be *failer of Record*.

FAYNT-PLEADER, in Law, signifies a False, Covenous, or Collusory Manner of Pleading, to the Deceit of a third Party.

FEALTY, in Law, signifies an Oath taken at the Admittance of every Tenant, to be true to the Lord of whom he holdeth his Land.

FEAVER, is a Fermentation, or inordinate Motion of the Blood, and a too great Heat of it, attended with Burning, Thirst, and other Symptoms, whereby the Natural Oeconomy or Government of the Body is variously disturb'd.

Feavers, in general, may be divided into two sorts, viz. *Continual*, or *Intermittent*: *Continual Feaver* is that whose Fit is continued for many Days, having its Times of Remission, and of more Fierceness, but never of Intermission.

Intermittent Feavers, commonly called *Agues*, have certain Times of Intermission, beginning, for the most part, with Cold or Shivering, ending in Sweat, and returning exactly at set Periods.

As for the several Subalteran Spices of *Continual* and *Intermitting Feavers*, you will find them particularly enumerated in the Books of Physicians.

FEAZING, at Sea, is the ravelling out of the Cable or any great Rope at the Ends.

FEBRIFUGE, is a Medicine which will cure an intermitting Feaver: Thus we say the *Cortex Peruvianus*, or *Jesuits-Bark*, rightly given, is the most certain *Febrifuge*.

PECULAE, are Dregs that subside in the Squeezing of certain Vegetables; as in *Briomy*, &c.

FEE, *Feudum vel Feodum*, in Common Law, signifies, as Sir Henry Spelman defines it, a Right which the Vassal hath in Land, or some immoveable thing of his Lord's, to use the same, and take the Profits thereof Hereditarily, rendering unto his Lord such Feudal Duties and Services as belong to Military Tenure, the meer Propriety of the Soil always remaining to the Lord.

This Word *Fee* is sometimes used with us for the Compass or Circuit of a Manor or Lordship; also for a Personal Right Incorporeal, as to have the keeping of Prisons in *Fee*. And 'tis taken for a Reward or Wages given to one for the Execution of his Office: As also, for that Consideration given a Sergeant at Law, or Counsellor, or a Physician, for their Counsel and Advice in their Profession.

FEE-ABSOLUTE, or *Fee-simple*, is that of which we are seized in these general Words, *To us and our Heirs for ever*.

FEE-CONDITIONAL, or *Fee-Tail*, is that whereof we are seized to us and our Heirs with Limitation; that is, the Heirs of our Bodies, &c. And this *Fee-Tail* is either *General* or *Special*:

General, is where Land is given to a Man, and the Heirs of his Body.

Fee-Tail Special, is that where a Man and his Wife be seized of Lands, to them and the Heirs of their Bodies.

FEE-FARM, in a Legal Sense, signifies Lands held of another in *Fee*, that is, in Perpetuity to himself and his Heirs, for so much Yearly Rent as it is reasonably worth, more or less, so it be the Fourth Part of the Worth: *Old Tenures*.

FEE-SIMPLE: See *Fee-Absolute*.

FEE-TAIL: See *Fee-Conditional*.

FIELD, in Heraldry, is the whole Surface of any Escutcheon or Shield, being supposed to be overspread with some Metal, Furr, or Colour, and containing the Charge, if there be any. In Blazoning a Coat, you must always begin with the Field: See *Blazon*.

FELLOWSHIP, or *Partnership*, in Arithmetick, is a Rule of very great Use to balance Accounts amongst Merchants and Owners of Ships; for when any Number of Persons put together a general Stock, so that it be required to give to every one his proportional Share of the Loss or Gain:

The *Golden Rule* several ways repeated, will fully answer such Questions.

For, *As the whole Stock* (or general Antecedent): *Is to the Total thereby gain'd or lost* (which is the general Consequent) :: *So each Man's particular Share: Is to his proper Share of Loss or Gain*.

Wherefore let the several Moneys of every Partner be gathered into one Sum, which makes the First Term, the common Gain or Loss the Second; every Man's particular Share the Third, working the *Golden Rule* so many several times as there are Partners.

There be two Parts of this Rule, *without Time*, and *with Time*.

Fellowship without Time.

Example I.

A, B, and C freight a Ship with Wine; viz. A lays out 1342 l. B, 1178 l. C, 630 l. the whole 212 Tun of Wine is sold at 32 l. a Tun. What shall each Man receive?

First find out the Price received, by multiplying 212 by 32, which makes 6784: Then add up the several Stocks, 1342 l. 1178 l. and 630 l. which makes 3150 l. and the Work stands thus;

$$3150 : 6784 :: \begin{cases} 1342 : \text{Answer } 2890,199+ \\ 1178 : \text{Answer } 2537,001+ \\ 630 : \text{Answer } 1356,800 \end{cases}$$

$$\text{Proof } 3150 \quad 6784$$

Example II.

A hath Half a Ship, B a Quarter, C one Sixteenth, and D three Sixteenths: The Master of the Ship brings an Account, and clears 120 l. How much must each Person have?

Account the Ship is 16, and the Gain 120 l.

$$16 : 120 :: \begin{cases} 8 : \text{Answer } 60 \\ 4 : \text{Answer } 30 \\ 1 : \text{Answer } 7,5 \\ 3 : \text{Answer } 22,5 \end{cases}$$

$$16 \quad 120$$

Fellowship with Time.

Example I.

A Ship's Company take a Prize of 300 l. which is to be divided amongst them, according to their Pay and Time they have been on Board: The Officers and Midship-men 5 Months, and the Sailors 3 Months: The Officers one with another, 40 s. per Month; the Midship-men 30 s. per Month; and the Sailors 22 s. per Month: There were 6 Officers, 12 Midship-men, 84 Sailors: What must each Party have of the Prize?

For a general Stock I begin first with the Officers, which are 6, and that multiplied by the Rate of 40 s. gives 240, which multiplied by 5 Months, make 1200 s.

After the same Fashion I find the Midship-men's Stock 1800 s. and the Sailor's 5544 s. All added together make 8544 s. for the whole Stock, and the Work stands thus:

$$8544 : 300 :: \begin{cases} 1200 : \text{Answer } 42,1232 \\ 1800 : \text{Answer } 63,2029 \\ 5544 : \text{Answer } 194,6629 \end{cases} \quad 299,999 = 300$$

Which Decimals reduced, give for

Example II.

A, B, C enter into Partnership, the First of January, for a whole Year; A the same Day disbursed 100 l. whereof he received back again upon the first of April 20 l. B payeth on the first of March 60 l. and more the first of August 100 l. C payeth the first of July 140 l. but the first of October withdraweth 40 l. At the Year's End their clear Gain is 142 l. How much therefore ought every particular Person to have?

Answer.

A 51 l. B 55 l. C 36 l. which makes the whole Gain 142 l. without Consideration of Interest. For A 100 into 3, is 300 l. and 80 into 9 = 720, in all 1020 l. for A: For B, 60 into 10, is 600, and 100 into 5, is 500, in all 1100 for B: For C, 140 into 3, is 420, and 100 in 3, is 300; into all 720 for C.

Now 1020 + 1100 + 720 = 2840 for the General Antecedent, and the Gain 142 for the General Consequent; then the Rule stands thus;

$$2840 : 142 :: \begin{cases} 1020 : \text{Answer } 51 \\ 1100 : \text{Answer } 55 \\ 720 : \text{Answer } 36 \end{cases}$$

142 l.

FELO de se, is he that commits Felony by Murthering of himself.

FELONY, in Common Law, is accounted any Offence, that is in Degree next *Petit-Treason*, and compriseth divers Particulars, as Murther, Theft, killing of a Man's Self, Sodomy, Rape, wilful burning of Houses, and such like.

The Difference between *Felony* and lighter Offences, is this, That the Punishment thereof is Death; yet not in all Cases: For *Petit-Larceny*, which is the stealing of any Thing under Value of Twelve Pence, is *Felony*, because the Indictment against such a one must have these Words *Felonice cepit*; and yet this is not punished by Death, though it be loss of Goods. Any other Exception I know not, but that a Man may call that Felony, which is under *Petit-Treason*, and punished by Death. And of this may be reckon'd two sorts, one lighter, that for the first time may have the benefit of the Clergy; another that may not.

FEMOREUS: See *Crureus*.

FEMUR, and *Femen*, the Thigh, the Part from the Buttocks to the Knee; it is so called *à ferendo* from bearing, because it holds up, and sustains an Animal. It consists but of one Bone, but that the greatest and longest in the whole Body, whose external and fore Part is gibbous or rising, but the internal hinder Part flat and bending. Grammarians make *Femen* to be the hinder fleshy Part; and *Femur* the former outward Part. *Blanchard*.

FEND, (for defend) is the Sea Word for saving a Boat from being dash'd against the Rocks, Shore, or Ship's Sides. This they call *Fending the Boat*; and accordingly

FENDERS with them signifies any Pieces of old Cable Ropes or Billets of Wood, which they hang over the Ship's Side to keep other Ships from rubbing against her: Boats have the same, as also little short Staves, called by this Name of Fenders, with which they keep the Boat from beating and staving against the Ship's Side.

FENESTRA Ovalis, is a Hole in the Barrel of the Ear, whereon the Basis of the *Stapes* stands: It is the Entry to the *Vestibulum*.

FENESTRA Rotunda, is a Hole in the Barrel of the Ear, which leads to the *Cochlea*, and is covered by a fine Membrane, inclosed in a Rift of this Hole.

FEOD: See *Fee*.

FEODARY.

FEOFFEE, is he that is infeoffed, or to whom the Feoffment is so made.

FEOFFMENT, in Common Law, signifies any Gift or Grant of any Honours, Castles, Manors, Messuages, Lands, or other corporeal and immovable Things of like Nature unto another in *Fee-Simple*; that is, to him and his Heirs for ever, by the Delivery of Seisin, and the Possession of the Thing given, whether the Gift be made by Deed or Writing: And when it is in Writing, 'tis called, *The Deed of Feoffment*; and in every *Feoffment*, the Giver is called the *Feoffor*, or *Feofator*.

And the proper Difference between a Feoffor and a Donor, is, that the Feoffor gives in *Fee-Simple*, the Donor in *Fee-Tail*.

FEOFFOR, is he that infeoffs, or makes a Feoffment to another, of Lands or Tenements in *Fee-Simple*.

FERDEMOULIN, a Bearing in Heraldry of this Figure. It represents the Iron-Ink, or Ink of a Mill; and is born by the Name of *Bevertham*, and also by the Name *Turner*.



FERMENTATION, is an easy, gentle, slow Motion of the Intestine or inward Particles of a mix'd Body, arising usually from the Operation of some Active Acid Matter which rarifies, exalts, and subtilizes the soft and sulphureous Particles, as when *Leaven* or *Yeast* rarifies, lightens, and ferments *Bread*, or *Wort*, &c. And this Motion differs much from that usually called *Ebullition* or *Effervescence*, which is a violent boiling and struggling between an Acid and an Alkali, when mix'd together.

Hence any gentle Motion of the Parts of the Blood, or Juices in the Body, occasioned by something which helps to clarify, exalt, and subtilize them, and to reduce them into an Healthful and Natural State, is called by this Name of *Fermentation*, as well as in the expressed Juices of Fruits, &c. *Lemery* confounds *Effervescence* and *Fermentation* together, but I think erroneously.

FERRUGINOUS, that which hath in it something of the Nature of Iron; as those Waters have which are otherwise called *Chalybeate*, such as those of *Tunbridge Wells*, &c.

FERULE, which the Surgeons call *Splinters*, are little Chips or Planes, which are made of different Matter, according to the Nature and Necessities of the Places to which they are applied, as of Barks of Trees, of the Bark of the Herb *Sagapene*, in Latin, *Ferula*; whence they have their Name: They are made of Firr, Paper glw'd together, Leather, &c. which are apply'd to Bones that have been loosened or disjointed, after they are set again. *Blanchard*.

FESSE, one of the Honourable Ordinaries in Heraldry, representing a broad Girdle, or Belt of Honour, which Knights at Arms were anciently girded withal: It possesseth the Center of the Escutcheon, and contains in Breadth one third part thereof; thus.



He beareth *Azure*, a *Fesse Or*, by the Name of *Eliott*.

The *Fesse* is divided into the *Barry*, and the *Clasett* of the *Barrulet*; which see.

Fesse Point, is the very middle Point: See the Word *Escutcheon*.

FEUDE. *Littleton* makes a *Feude* a Tenure; The *Civilians* define it to be a Grant of Lands, Honours or Fees made either to a Man at the Will of the Lord, or Sovereign, or for the *Feudatory's* (i. e. the Person to whom the Grant is made) own Life, or to him and his Heirs for ever; upon Condition that he and his Heirs (in Case where the *Feude* is perpetual) do acknowledge the Giver and his Heirs to be their Lord and Sovereign, and shall bear Faith and true Allegiance to him and his for the said *Tenure*, and shall do such Service to him and his for the same, as is between them covenanted, or is proper to the Nature of a *Feude*.

And hence the last Volume or Tome of the Civil Law, is called the

FEUDES: That is, the Books of Customs and Service that the Subject or Vassal doth to his Prince or Lord for the Lands, Tenures; or Fees that he holdeth of him.

This Part of the Civil Law was not much in use in the Old Emperors Time; but it seems to be acknowledged by *Justinian* in his Novels; where he calls them: Some derive them from the ancient *Clientels* among the *Romans*, before Christ's Time, as *Badeus* in particular: Others bring them from the Practice of *Alexander Severus*, who to encourage them to perpetual Service in his Wars, divided the Lands of the Enemy amongst his Soldiers. So *Lampridius* in the Life of *Alexander Severus*.

But others refer it to the Time of *Constantine the Great*, who settled the Lands out of which the Soldiers had formerly their Wages, on them and their Heirs for ever, provided they found and maintained for ever such a Number of Soldiers.

But let its Original be what or when it will, it came but late into the Body of the Civil Law, and to constitute, as it doth now, a particular Volume of it.

The Compilers or Collectors of it, were *Obertus de Horito*, and *Giraldus Compagistus*, two Senators of *Milan*, who drew it partly from the *Civil Law*, and partly from the ancient Customs of *Milan*, but without any good Form or Order. For the Original of *Feudes*, see *Cujacius*, and Sir *Henry Spelman's Glossary*.

FIBRA Auris, the same with *Lobus Auris*.

FIBRÆ, *Fibres*, by the Anatomists are accounted little round oblong Vessels, and are either *Musculous* or *Nervous*.

The *Nervous*, are such as have no Valves, and by which the Spirits flow conveniently from the Nerves to the several Parts.

The *Musculous Fibres* receive the Blood from the Arteries, and discharge themselves into the Veins, and have a great many Valves: They are called Long, Round, or Oblique, from their Form

and Situation. Some small Threads interwoven with Trees and Leaves, are called *Fibres* too; and so are the small Threads which stick to their Roots, and which fasten the small Roots to the Earth: Also, those Strings which go from the bottom of the bulbous Roots are called by this Name; and in general, it signifies any small Strings which compose the Texture of any Part of an Animal or Vegetable Body.

FIBULA, a Term in Surgery, as the Ancients mention it; for if there be a Wound in the Flesh, says *Celsus*, that gapes, and cannot easily be closed, it is improper to sew it, you must apply a *Fibula*: But because this way of closing the gaping of Wounds by *Fibula's* was usual amongst the Ancients, they have not been at all solicitous in describing either their Matter or Form. *Guido* tells us, That they made these *Fibula's* of Iron Circles as it were, or Semicircles crooked backward on both sides; the Hooks whereof being fastened on both sides to the gaping Wound, answered exactly one another; but since this must be an insupportable Pain to the poor Patient, it is hardly credible, that they meant any such thing by their *Fibula's*.

The Opinion of *Fallopins* is more probable, who tells us, That it was only sewing up the Wound with a Needle and Thread, which is commonly used at this Day.

Sanctorius writes thus, We need not discourse much of *Fibula's*, since the use of them is almost out of doors; and tho' the Ancients have not describ'd them, yet they forbear not to acquaint us how to use them, as *Argentarius* falsely imagines: For not only Physicians, but some of the Ancients knew the Form of them, since *Corn. Celsus* has inform'd us, That *Fibula's* as well as *Sutures*, were made of a Needleful of soft untwisted Silk or Thread, where-with they sewed the gaping Lips of the Wound together.

Some call *Acia*, or this Needleful of Thread, *Vinculum*, *Ligatura*, *Colligatio*, *Obligatio*, *Ligamentum*; all which signifies tying or binding. Whoever would be further inform'd in this Particular, may consult the Incomparable *Rhodius*, in his Discourse about *Acia*. *Blanchard*.

FIBULA, or *Focile minus*, in Greek *πρόγον*, is the lesser and outer Bone of the Leg; it seems to join the Muscles of the Leg like a Button or Clasp, in Latin *Fibula*; it is the hinder Bone betwixt the Knee and the Feet, smaller than the other Bone called *Tibia*, and fastened outwardly to it, as the Bone called *Radius* in the Arm is to the Cubit; its round Head does not extend as far as the Knee upward, but receives the lateral Knob of the *Tibia* in a small Sinus which it hath in its inner Side; downwards it goes farther than the other Bone called *Tibia*, and therefore is altogether as long a Bone as that, tho' much smaller. They part in the Middle, because the Muscles that extend the Feet and Toes are placed there; in which Interval a slender, broad, membranous Ligament joins them together lengthways: It is joined likewise to the *Tibia*, by its lower End, which is received into a small Sinus of it; and then it extends into a large Process which forms the outward Ankle, embracing the external Side of the *Atragalus*.

FICHANT Flank: See *Flank*.

FICHANT Line of Defence: See *Fixed Line of Defence*.

FICUS, are the external Protuberances of the *Anus*, otherwise called the *Piles*. They are also sometimes called *Mariscae*, and *Sycoses*.

FIDD, an Iron Pin used at Sea to splice or fasten Ropes together. 'Tis made tapering and sharp at one end. There are also Fidds of Wood, which are much larger than the Iron ones. The Pin also in the Heel of the Topmast, which bears it upon the Chets-trees, is called a Fidd. There is also a *Fidd Hammer*, whose Handle is a *Fidd*, or made tapering into that form.

FIELD-Port: See *Fortin*.

FIERI facias, is a Writ Judicial that lieth at all times within the Year and Day, for him that hath recovered in an Action of Debt or Damages, to the Sheriff, to command him to levy the Debt or the Damages of his Goods against whom the Recovery was had.

FIFTH, a term in Musick, the same with *Diapente*; which see.

FIGHTS, in a Ship, are the waste Cloths which hang round about her in a Fight, to hinder the Men from being seen by the Enemy; and they call those Bulkheads afore or abaft the Shift which are put up for Men to stand secure behind and Fire on the Enemy in case of Boarding, *Cloze Fights*.

FIGURAL, or *Figurate Numbers*, are such as do or may represent some Geometrical Figure, in relation to which they are always considered; and are either *Lineary*, *Superficial*, or *Solid*; which see.

FIGURATE Descant: See *Descant*.

FIGURATIVE Speeches, are ways of expressing our selves, in which we use an improper Word, which Custom has applied to another Subject.

FIGURE, in Physicks or Natural Philosophy, is the Surface or terminating Extrems of any Body.

FIGURE, in Conicks, according to *Apollonius*, is the Rectangle made under the *Latus Rectum* and *Transversum* in the *Hyperbola* and *Ellipsis*.

FIGURE, in Geometry, is a Space compassed round on all Sides, and are either *Rectilineal*, *Curvilineal* or *Mixt*.

FIGURES, in Arithmetick, are the 9 Digits or Numeral Characters, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 0.

FIGURES in Discourse, are extraordinary ways of Speaking, different and remote from such as are Ordinary and Natural, and they are either *Grammatical* or *Rhetorical*.

FIGURES Curvilineal, are such as have their Extremities crooked, as *Circles*, *Ellipses*, &c.

FIGURES Grammatical, are used in Construction, when we digress from the common and ordinary Rules, as by omitting some Word; and leaving it to those to whom we speak, to supply it.

FIGURES Mixt, are such as are bounded partly by right Lines, and partly by crooked ones, as a *Semicircle*, *Segment of a Circle*, &c.

FIGURES Plane, (or *Plane Surfaces*) are such as are terminated and bounded by right Lines only.

FIGURES Rectilineal, are those that have their Extremities all right Lines, as *Triangles*, *Quadrilaterals*, &c. *Polygons* Regular, Irregular, &c.

FIGURES Rhetorical, serve sometimes to express the Commotions and violent Agitations of the Mind in our Passions or warm eager Discourses; and sometimes only to embellish and adorn our Speech, or to move the Audience the more pathetically.

FILACER, is an Officer in the *Common-Pleas*, so called, because he Files those Writs whereon he makes Process. There are fourteen of them in their several Divisions and Counties. They make out all original Process, as well Real, as Personal and Mixt; and in Actions merely Personal, where the

Defendants be Return'd or Summon'd, there goeth out the Distress infinite until Appearance: if he be Returned *nihil*, there Process of *Capias* infinite, if the Plaintiff will; or after the third *Capias* the Plaintiff may go to the *Exigent* of the Shire, where his Original is grounded, and have an Exigent or Proclamation made.

FILAMENTS, little, thin, slender Rags like Threads, such as sometimes appear in Urine: Also the small Fibres or Threads which compose the Texture of the Muscles, &c. or other Parts of any Animal or Vegetable Body, are sometimes called by this Name.

FILE, or *Label*, in Heraldry is of this Form, tho' sometimes of more and sometimes of fewer Points. 'Tis sometimes born as a Charge in a Coat Armour, of which *Gwylim* gives many Instances: But 'tis usually the difference or mark of Distinction which the Elder Brother bears in his Coat during his Father's Life.

Some distinguish *File* and *Label*, calling the File the upper Horizontal Line, and the Label the Point that issues from it.

FILE, in Military Language, is a row of Men standing one behind or below another from the Front to the Rear.

FILET, a little Member in Architecture, which appears in the Ornaments and Mouldings, and is otherwise called *Lisfel*.

FILLET, in Heraldry, is a 4th part of the Ordinary called a *Chief*, and is placed in the chief Point of the Escutcheon.

FILTRATION, is the passing a Liquor (in order to its Purification) through a woollen Cloth, or usually through a Coffin of brown Paper; and this the Chymists mean when they direct you to *Filtrate* any thing.

The most exact way of Filtration, is to take a long piece of linnen or woollen Cloth, and dipping one end of it in the Liquor to be Filtrated, hang the other (which must be the longer end) over the brims of the Vessel, and you will see the Liquor rise up and run over the brims through the Body of the *Filtre*; and it will do so very pure, and free from all Dregs.

The Cause of the ascent of Liquors in the *filtre*, is generally said to be, that the Liquor swelling those parts of the *filtre* that touch it, by entering into the Pores of the Threads of which it is composed, doth raise them up, make them touch, and wet those that are next above them; and these again the next Threads, and so on till you come to the brims of the Vessel, and then the Liquor runs over and descends in the other part of the *Filtre*, which hangs down, by its own natural Gravity.

But 'tis certain that in very slender glass Pipes, whose Cavities are not much larger than Hairs, Water or any Fluid (but Quicksilver) will ascend in them to a considerable height, as soon as ever you dip their ends into it; and in Pipes or Tubes of much larger Bores, the Liquor will be higher (something) within the Tube than without it. And yet here the swelling of the parts of the glass Pipe cannot be urged as the Reason for the ascent of the Water in them.

If also you fill a Pipe of a moderate Bore with the powdered *Calx* of a Metal, (as Mr. Boyle tried it with *Minium* or red Lead) and then immerse the lower end of this Tube in Water, the Water shall gradually arise in the Tube till it attain the height of 30 or 40 Inches; and yet it cannot be said that any of the Particles of this Metalline Powder, are swelled at all by the Water.

Therefore



Therefore the true Cause of the ascent of Water in a Philtre, is probably this: That every Philtre being composed of a great Number of long small solid Bodies, which lie very close together, the Air getting in between them, loses much of its pressure, and cannot gravitate there so strongly as it doth on the Fluid without them: Wherefore the Parts of the Water between the Threads of the Filtrè must be pressed upwards, and ascend till they come so high, as by their Weight to counter-balance the general pressure on the other Parts of the Surface of the Water.



FIMBRIATED, a Term in Heraldry, signifying that an Ordinary is edged round with another of a different Colour, as thus.

He beareth Or, a Cross, Patee Gules Fimbriated Sable.

FINAL Causes, are such great, wise, and good Ends as God Almighty, the Author of Nature, had in Creating and Proportioning, in Adapting and Disposing, in Preserving and Continuing, all the several Parts of the Universe. On this Subject the Honourable Mr. Boyle hath a very good Discourse: And that good Mathematician Mr. Keil of Oxford, in his Refutation of Burnet's *Theory of the Earth*, shews that Final Causes are the best Principles for Men to regulate their Philosophical Theories and Speculations by.

FINE, in common Law, hath divers Applications; for sometimes 'tis used for a formal or ceremonious Conveyance of Lands or Tenements, or of any Things inheritable, being in *esse tempore finis*, to the end to cut off all Controversies. Others define it to be a final Agreement had between Persons concerning any Lands or Rent, or other thing whereof any Suit or Writ is between them hanging in any Court. A Fine hath in it five essential Parts.

1. The Original Writ taken out against the Cognitor.
2. The King's Licence, giving the Parties Liberty to accord; for which he hath a *Fine* called the *King's Silver*, being accounted a Part of the Revenue of the Crown.
3. The Concord it self, which thus beginneth *Et est concordia talis*, &c.
4. The Note of the *Fine*, which is an abstract of the original Concord, and beginneth in this manner: *Scil. Inter R. Querentem* &c. *S. E. uxorem ejus, desorciante*, &c.
5. The Foot of the *Fine* which beginneth thus: *Hec est finalis concordia facta in curia Domini Regis apud Westmonasterium a die Pasche in quindecim dies, anno*, &c. So as the Foot of the *Fine* includeth all, containeth the Day, Year, and Place, and before what Justice made.

This Word *Fine* sometimes signifies a Sum of Money paid for an Income to Lands or Tenements let by Lease; and sometimes, an Amends, Pecuniary Punishment or Recompence upon an Offence committed against the King and his Laws, or against the Lord of the Mannor.

FINE annullando levato de Tenemento quod fuit de antiquo dominio: Is a Writ to the Justices for the dissanulling of a *Fine* levied of Lands holden in Ancient Demesne to the Prejudice of the Lord.

FINE capiendo pro terris, &c. Is a Writ lying for one that upon Conviction by a Jury, having his Lands and Goods taken into the King's Hands, and his Body committed to Prison, obtaineth Favour for

a Sum of Money, &c. to be remitted his Imprisonment, and his Lands and Goods to be re-delivered unto him.

FINE force, signifies an absolute Necessity or Constraint not avoidable; as when a Man is constrained to do that which he can no way avoid, we say, He doth it *de fine force*.

FINE levando de Tenementis tenentis de Rege in Capite, &c. is a Writ directed to the Justices of the Common Pleas, whereby to licence them to admit of a *Fine* for Sale of Lands holden in *Capite*.

FINE non capiendo pro pulchre placitando, is a Writ to inhibit Officers of Courts to take *Fines* for fair Pleading.

FINE pro redisseisina capienda, &c. is a Writ that lieth for the Release of one laid in Prison for a *Resseisin*, upon a reasonable *Fine*.

Fines for Alienation, are reasonable *Fines* paid to the King by his Tenants in Chief, for Licence to Alien their Lands.

FINITE, is what hath fix'd and determined Bounds or Limits set to its Power, Extent or Duration.

FINITOR, the same with *Horizon*; and 'tis so called, because the Horizon finiteth or terminates your Sight, View, or Prospect.

FIRMAMENT, by some Astronomers is taken for the Orb of the Fixed Stars, or an Eighth Heaven: But more properly, 'tis that Space which is expanded or arched over us above in the Heavens.

FIRMNESS or *Solidity*, Mr. Boyle describes to consist principally in this, that the Particles composing such Bodies as we call Firm or Solid, are pretty gross; and either are *so much at Rest*, or are *so Intangled* one with another, that there is a mutual Cohesion of their Parts; and that they cannot flow from, slide over one another, or diffuse themselves every way from one another, as the Parts of Fluid Bodies can; and consequently the Figure of Firm or Solid Bodies, ought rather to be attributed to the Connexion of the Parts that compose them, than to the Impressions of outward Bodies.

And in his History of Firmness, he proves by Experiments, and good Considerations upon them, the several Parts of the above given Description. As,

1. He shews the *Grossness* of Parts are (*cateris paribus*) requisite to Firmness or Solidity, because *Minutens* he had before proved, was necessary to the Parts of Fluid Bodies.

2. Rest also, and *juxta Position* of Parts, he demonstrates by many Experiments, are in a Degree absolutely requisite to produce this Effect. And,

3. The Pressure and Weight of the Incumbent Atmosphere he judges contributes much toward it, because of the strong Adherence of two Pieces of Polished Glass, or Marble together, in the open Air, which will immediately separate in the exhausted Receiver.

4. The Texture of the Bodies, and the Figures of their Parts many contribute much to this Effect; as if they be of an hooked Form, or any way entangled one in another, they must be disjoined with difficulty, and consequently will be in the Form of a Solid.

And 'tis a very surprizing Experiment, that two Parts of Spirit of Wine, mixed with one of Spirit of Hartshorn, or Urine (both highly rectified) will, in a Minute, unite into a consistent Body, or white *Coagulum*; which some call *Offa alba*.

FIRST MOVER: See *Primum Mobile*.

FISHES, are Pieces of Timber used to strengthen the Masts or Yards aboard of a Ship, when they begin to fail in a Stress of Weather. They both nail the Fishes on with Iron Spikes, and also *would* them, as they call it; that is, winding Ropes hard round about

about them. There is also a Tackle called

The Fish, which hangs at the End of the *David* by the *Sirap* of the *Block*, in which is the Runner of the *Fish-hook*; by which Means the Fluke of the Anchor is haled up to the Ship's *Bow*, or *Chainsaille*. Perhaps this Tackle was called a *Fish*, from that which the Ancients called the *Dolphin*, which was a pointed and vastly heavy Piece of Iron, and which they used to heave up by a Tackle to a good Height, and then, when they come near enough to the Enemy's Ship, let it fall at once, which would break or pierce a Hole through the Bottom of the Enemy's Vessel, and sink her.

FISSURA Ossis, is the Term for a Cleft or a Fracture of a Bone lengthways.

FISSURES, the several *Layers* or *Strata*, of which the Body of our Terrestrial Globe is composed, are distinguished from one another, and divided Horizontally or Parallely by some Interruptions which they call *Fissures*; and these are intersected again by other *Fissures*, which, by reason of their Situation, are called *Perpendicular Fissures*: See *Woodward's Nat. Hist. of Earth*, P. 10.

FISTULA, is a long Cavity, strait or winding about, in any Part of the Body, being a narrow and callous Ulcer of difficult Cure, proceeding usually from an Aposteme. *Blanchard*.

Fistulae differ from winding Ulcers in this, that *Fistulae* are callous and hard, but Ulcers are not. *Blanchard*.

FISTULA Lachrymalis, is when the *Punctum Lachrymale*, the little Hole in the Bone of the Nose, through which the Liquid Matter of the Tears passes to the Nostils; is grown hard and callous from an Ulcer of the *Carnicula* (which are *Glandules* placed at the greater Corners of the Eye) by which means there happens a continual Defluxion of Tears. *Blanchard*.

FISTULA Pulmonis, in some Writers, is the same with the *Apera Arteria*.

FISTULA Sacra, is that Part of the Back-bone which is perforated. *Blanchard*.

FISTULA Urimaria, the same with the *Urethra*.



FITCHEE, the Term in Heraldry, when the lower Part of any Cross is sharpened into a Point, thus.

Azure a Cross potent Fitchee.

FIXED Line of Defence, in Fortification, is drawn along the Face of the Bastion, and terminates in the *Courline*.

FIXED Signs of the Zodiack, according to some, are *Taurus*, *Leo*, *Scorpio*, and *Aquarius*. And they are so called, because the Sun passes them respectively in the Middle of each Quarter, when that particular Season is more settled and fixed than under the Sign that begins or ends it.

FIXITY, or *Fixtness*, is the opposite Quality to *Volatility*; and the Excellent Mr. Boyle reckons these Qualifications following to be the most conducing for the rendring of a Portion of Matter *Fixt*.

1. That its Corpuscles be singly of a proportionate large Bulk or Grossness, so as to be too big and unwieldy to be carried up by Heat, or to be buoyed up in the Air.

2. That these Corpuscles have also a proportional Degree of Ponderousness or Solidity.

3. That their Figure and Make also be such as renders them unfit for Avolation, either from their Shape, being branched, crooked, hooked, &c. so that they be entangled one with another, and cannot easily be extricated, loosened, or separated: And therefore whatever will produce these three Requisites in any Body, will render it of a fixt Nature.

4. To these may be added also the bringing the Corpuscles or Particles of any Body to touch one another in a considerably larger Part of their Surface.

FIXT Nitre, is Salt-petre melted in a Crucible, and then made to flame, by throwing in a Spoonful of Powder of Coals; and this is repeated till no Flame nor Denotation arise: After this 'tis cooled, powdered, and dissolved in Water, and then evaporated into a fine white Salt. 'Tis a Salt much like that of Tartar, and is used, like it, to help draw Tinctures out of Vegetables. Some Chymists give it the Name of *Alkabeft*, because 'tis, as they say, a kind of Universal Dissolvent. If this Salt be exposed to the Air in a cool Place, it will all dissolve into a Water, or as they say, run *per Deliquium*; and this is called, *The Liquor of Fixt Nitre*.

FIXED Stars, are such as do not, like the Planets or *Erratick Stars*, change their Positions or Distances in respect of one another.

Because these *Fixed Stars* have no sensible Parallax arising from the Annual Motion of the Earth, they are justly esteemed to be at such an immense Distance, as to have no sensible Effect on our Earth.

The Honourable Mr. Roberts hath a pretty Discourse about the Distance of the *Fixed Stars*, which is published in *Philos. Trans. N. 209*. The Substance of which is as follows.

Since the *Pythagorean System* of the World has been revived by *Copernicus*, (and now by all Mathematicians accepted for the *True one*) there seemed Ground to imagine, that the Diameter of the Earth's Annual Course (which according to our best Astronomers, is at least 40000 Times bigger than our Earth's) might give a sensible Parallax to the *Fixed Stars*, though the other could not, and thereby determine their Distance more precisely.

But though we have a Foundation to build on, so vastly exceeding that of the Ancients, there are some Considerations may make us suspect, that even this is not large enough for our Purpose.

Mr. *Hugens* (who was very exact in his Astronomical Observations) tells us, he could never discover any visible Magnitude in the *Fixed Stars*, tho' he used Glasses which magnify the apparent Diameter above a hundred Times.

Now, since in all likelihood the *Fixed Stars* are Suns (perhaps of a different Magnitude) we may, as a reasonable Medium, presume they are generally about the Bigness of our Sun.

Let us then (for Example) suppose the *Dog-star* to be so.

The Distance from us to the Sun being about a hundred Times the Sun's Diameter, it is evident, that the Angle under which the *Dog-star* is seen in Mr. *Hugens*'s Telescope, must be near the same with the Angle of its Parallax to the Sun's Distance, or Semidiameter of the Earth's Annual Course; so that the Parallax to the whole Diameter can be but double such a Quantity, as even to Mr. *Hugens*'s nice Observation, is altogether insensible.

The Distance therefore of the Stars seems hardly within the reach of any of our Methods to determine; but from what has been laid down, we may draw some Conclusions that will much illustrate the prodigious vastness of it:

1. That the Diameter of the Earth's Annual Orb (which contains at least 160 Millions of Miles) is but as a Point in Comparison of it; at least it must be above 6000 Times the Distance of the Sun: For if a Star should appear through the aforesaid Telescope half a Minute broad (which is a pretty sensible Magnitude) the true apparent Diameter would not exceed 18 third Minutes, which is less than the 6000 Part of the apparent Diameter of the Sun, and consequently the Sun's Distance not the 6000 Part of the Distance of the Stars.

2. That could we advance towards the Stars 99 Parts of the whole Distance, and have only $\frac{1}{100}$ Part remaining, the Stars would appear little bigger to us than they do here; for they would shew no otherwise than they do through a Telescope, which magnifies an hundred-fold.

3. That at least Nine Parts in Ten of the Space between us and the *Fixed Stars*, can receive no greater Light from the Sun, or any of the Stars, than what we have from the Stars in a clear Night.

4. That Light takes up more time in travelling from the Stars to us, than we in making a *West-India Voyage* (which is ordinarily performed in six Weeks:) That a Sound would not arrive to us from thence in 50000 Years, nor a Cannon Bullet in a much longer Time. This is easily computed by allowing (according to Sir *Isaac Newton*) ten Minutes for the Journey of Light from the Sun hither; and that a Sound moves about 1200 Foot in a Second. But Sir *Isaac Newton* doth not allow above 968 Feet for the Motion of Sound in a Second of Time: And the *Florentine Academicks* make it about 1000 Feet.

Our Learned and Accurate Mr. *Flamsteed* saith, he hath discovered a sensible Parallax of the Earth's Annual Orbit in respect of the *Fixed Stars*; of which he published an Account in a Letter to Dr. *Wallis*, in the Year 1698, which is Printed in the Third Volume of *Wallis's Mathematical Works in Latin*.

FLAGS, on Board a Ship, are Colours, Ancients, or Standards which the Admirals of a Fleet bear on their Tops. The Admiral in Chief carries his on his *Main-Top*, the Vice Admiral his at the *Fore-Top*, and the Rere-Admiral his at his *Misken-Top*.

FLAIR, the Seamen say that the Work doth *flair over*, when a Ship being housed in near the Water, a little above that the Work hangs over a little too much, and so is let out broader aloft than the due Proportion will allow.

FLAMMA *Vitalis*; some do suppose that there resides in the Heart of Animals such a fine and kindled, but mild Substance, as they call a *Vital Flame*; and to its Preservation they judge the Air taken in by Respiration to be necessary, as it is to the Conservation of ordinary Flame.

The Excellent Mr. *Boyle*, by several Experiments purposely made in his exhausted Receiver, about the Relation between Flame and Air, found that the Vital Flame of Animals (if the Life may be so called) did survive or outlast the Flame of Spirit of Wine, or of a Wax or Tallow Candle; since the Animals would remain alive and well for 3 or 4 Minutes after the Receiver was evacuated, whereas no common Flame would last there one Minute.

The Light of Glow-worms that Noble Gentleman found also would presently be destroyed by the Exhausting Motion of the Air, by his Engine, as it would be re-produced again by its Admission into the Receiver.

FLANCH, an Ordinary in Heraldry, formed by an Arch-line, which begins at the Corners of the *Chief*, and ends in the *Base* of the *Escutcheon*, thus.

He beareth *Ermin*, two *Flanches Vert*.

Flanches are always born by Pairs: The *Flanch* bends in more than the *Flank*.



FLANK, in Fortification, is that Part of the Bastion which reaches from the Courtine to the Face, and defends the opposite Face, the Flank, and the Curtain.

There is also the Oblique or Second Flank, which is that Part of the Courtine where they can see to scour the Face of the opposite Bastion; and is the Distance between the Lines *Razant* and *Fitchant*.

The *Low*, *Covered*, or *Retired Flank*, is the Platform of the Casemate, which lies hid in the Bastion.

The *Flanks* of a Battalion, or an Army are its Sides.

They use also the Word to *Flank* an Army; that is, to discover and fire upon its Sides.

Any Fortification which hath no Defence right forwards, is on that Account Faulty and Defective; and to render it compleat, one Part must be made to flank another. The Courtine therefore is the strongest Part of any Fortified Place, because it is flanked by the two *Flanks* at its Ends.

FLANK, is also a Term of War, signifying one Side of a Battalion of an Army; as to attack the Enemy in Flank, is to discover and fire upon them on one Side.

FLANK of the Courtine, or *Second Flank*, is that Part of the Courtine between the Flank and the Point, where the *Fitchant Line of Defence* terminates.

To FLANK, in general, is to discover and fire upon the Side of any Place; but to

FLANK a Place, is to dispose a Bastion, or other like Work, in such a manner, that there shall be no Part of it but what is defended; so as you may from thence play upon Front and Rear: For any Fortification that hath no Defence, but just right forwards, is Faulty; and to render it compleat, one Part ought to be made to Flank the other: Hence the Courtine is always the strongest Part of any Place, because 'tis flanked at each End.

Fitchant FLANK, is that from whence a Cannon playing, fireth its Bullets directly in the Face of the opposite Bastion.

FLANK *Razant*, is the Point from whence the Line of Defence begins, from the Conjunction of which with the Courtine, the Shot only razeth the Face of the next Bastion, which happens when the Face cannot be discovered but from the Flank alone.

Retired FLANK, or the *Lower* or *Covert Flank*, is that Exterior Part thereof which advanceth to secure the Innermost; which advanced Part, if it be rounded, is called the *Orillon*; so that this *Flank Retire*, as the *French* call it, is only the Platform of the *Casemate*, which lies hid in the Bastion.

Simple FLANKS, are Lines which go from the Angle of the Shoulder to the Courtine, and whose

principal Function is the Defence of the Moat and Place.

FLANK'D, or *Double Tenaille*: See *Tenaille*.

FLANKING Line of Defence: See *Rasant Line of Defence*.

FLANKING Angle: See *Angle*.

FLANK'D Angle, is the Angle formed by the two Faces of the Bastion, and so forms the Point of the Bastion.

FLASK, is in Heraldry an *Ordinary* made by one Arch-line drawn downwards to the *Base Point*: It seems to be the Representation of a Bow, when bended; and they are always born double, thus,



The Field is Or, Two Flasks Azure.

Some Heralds say, The *Flask* is a Reward for a Man of Virtue and Learning, who hath deserved well of his Prince in an Embassy.

FLAT; to *flat* a Ship, is to hale in the Fore-sail by the Sheer, as near to the Ship's Sides as may be, which is called, *Flatting in the Fore-sail*. This is done when a Ship will not fall off from a Wind without it, though the Fore-sheet was haled aft.

FLAT Bastion: See *Bastion*.

FLAT-BOTTOM'D Moat: See *Moat*.

FLAT Crown: See *Corona*.

FLATUS, are Effervescencies excited in the Body from Wind let in, or from Flatulent Meats, or from the Bile and Pancreatick Juice mixed together, whence Wind and Noise.

FLEDWIT, a Term in Law, signifying a Discharge or Freedom from Amerciaments, where one having been an Outlaw'd Fugitive, cometh to the Peace of our Lord of his own accord.

FLEMESWITE, in Law, signifies the Liberty to challenge the Cattel, or Amerciaments of your Man, a Fugitive.

FLESH, of any Animal Body, is by Anatomists defined to be a Similar and Fibrous Part, soft and thick: Of this they reckon five Kinds.

1. Muscular, Fibrous, or Fistular Flesh, such as is the Substance of the Heart, and other Muscles.

2. *Parenchymous* Flesh, as that of the Lungs, Liver, and Spleen was thought to be by the Ancients; but since the Use of Glasses 'tis plainly discovered that there is no such thing as a *Parenchyma*, properly speaking, but that all the *Viscera*, as well as other Parts of the Body, are *Vascular*, and nothing but *Plexus*, or Net-work of small Vessels and Canals.

3. *Viscerous*, such as the Flesh of the Stomach and Guts.

4. *Glandulous*, as that of the *Tonsils*, the *Pancreas*, the Breasts, &c.

5. *Spurious*, so they call the Flesh of the Lips, Gums, the *Glands of the Penis*, &c. because 'tis of a Constitution different from all the rest.

FLEXOR Carpi *Radialis*, is a Muscle of the Wrist, which ariseth Tendinous from the Internal Extuberance of the *Os Humeri*, becoming Flethy, adheres strictly to the *Pronator Radij-Teres*, and in half its Oblique Progress to the *Carpus* it becomes a flat Tendon, which passeth over the Annular Ligament, and is inserted to the upper Part of the *Os Metacarpi*, which sustains the Fore-finger: Its Name shews its Use.

FLEXOR Carpi *Ulnaris*, is a Muscle of the Wrist, which arises Tendinous from the same Tubercle of

the Shoulder-bone, with the *Flexor Radialis*; as also from the superior and external Part of the *Ulna*, where the *Musculus Perforans* doth arise; and continuing Flethy according to the length of the *Ulna*, is partly inferred by a short strong Tendon into the fourth Bone of the *Carpus*, and partly into the *Os Metacarpi*, which sustains the Little-finger. Its Name declares its Use.

FLEXOR *Secundi Internodii Digitorum Pedis*: See *Perforatus Pedis*.

FLEXOR *Tertii Internodii Digitorum Pedis*: See *Perforans*.

FLEXOR *Tertii Internodii*, or *Longissimus Pollicis*, is a Muscle of the Thumb, which is observed to have a twofold Beginning;

The First and Superior of which ariseth acutely from the Internal Extuberance of the *Os Humeri*, between the *Perforatus* and *Perforans*, becoming a Flethy Belly, and then Tendinous, joins with the middle Tendon of its other larger Head.

The Second or Inferior Origin of this Muscle (is that Part of it which is commonly described) arising with a double Order of Flethy Fibres for some space on the *Radius*, from immediately below its Superior Part, which uniting in a middle Line or Tendon (not unlike the *Fibrilla* of a Feather, joining to their *Stamina*) which passing over the Articulation of the *Carpus*, becomes entirely Tendinous, as it runs over the *Flexor primi & secundi Internodii* to its Implantation at the Superior Part of the third Bone of the Thumb.

FLEXOR *Pollicis Brevis*, is a Muscle of the great Toe, which ariseth from the Superior Part of the *Os Cuneiforme Medium*, and running over the Termination of the *Musculus Peroneus*, is implanted into the *Ossa Sesamoidea* of the Great Toe, who are likewise tied to the Superior Part of the second Bone of the said Toe which bends it.

FLEXOR *Pollicis Pedis Longus*, is a Muscle of the Great Toe, which is a direct Antagonist to the *Extensor Longus*: It arises opposite to it from the Back-part of the *Fibula*, with a double Order of Flethy Fibres, running to a middle Tendon (like the *Flexor tertii internodii Pollicis Manus*) which ceaseth to be Flethy as it passes over the Juncture, and runs through a Channel on the Internal Part of the *Os Calcis*, under the Tendon of the *Musculus Flexor Digitorum Longus Perforans*, over the *Flexor Pollicis Brevis*, and is inserted to the upper End of the second Bone of the Great Toe: Its Use is to bend the Toe.

FLEXOR *primi & secundi Ossis Pollicis*, is a large disgregated Flethy Muscle, arising from the *Ligamentum Transversale Carpi*, Bones of the *Carpus*, at the Basis of the *Mons Lunae*, and *Os Metacarpi* of the Middle Finger, whence it passes to its Insertion partly to the *Ossa Sesamoidea* of the second Internode, and partly to the first Bone of the Thumb: This (as *Vesalius* writes) may be divided into Three. Its Actions are various, according to the Diversity of its Series of Fibres; so it bends the first or second Bones of the Thumb, either directly or obliquely towards the *Carpus* and *Vola Manus*.

FLIE, that Part of the Mariner's Compass on which the 32 Winds are drawn, and to which the Needle is fastened underneath, they call the *Flie*.

FLOATING-BRIDGE, is a Bridge made in form of a Redoubt, consisting of two Boats covered with Planks, which ought to be so solidly Framed, as to bear both Horse and Cannon.

FLOND, or *Figurative Descant*, a Term in Music. See *Descant*.

FLOOR,

FLOOR, in a Ship, strictly taken, is so much only of her Bottom as she doth rest upon when she lieth on Ground; and therefore those Ships that have long, and withal broad Floors, lie on the Ground with most Security, and are not apt to *Seel* (that is, to fall on the one Side;) whereas the other which are *Cranck by the Ground*, (as the Sea Phrase is) that is narrow in the Floor, cannot be grounded without Peril either of being overthrown, or, at least, of wronging her Sides. And note, the Word *Overthrown* is used when a Ship is brought to be *trimmed a-ground*, and so by some Mischance doth fall over on her Side; but when a Ship at Sea is turned over on the one Side, she is said to be *Over-set*.



FLORY, a Term in Heraldry, when the Out-lines of any Ordinary are drawn, as if trimm'd with, or in the Form of Flowers.

Thus this Cross they call a *Cross-Flory*.

FLOTSON, or *Flotzam*, is a Word proper to the Sea, signifying any Goods lost by Shipwreck, and floating and swimming upon the Top of the Water; which, with *Jetson*, and *Lagon*, and others, are given to the Lord Admiral by his Letters Patent.

Jetson, is a thing cast out of the Ship, being in danger of Wreck, and beaten to the Shore by the Waters, or cast on the Shore by the Mariners.

Lagon, or *Lagan*, or *Ligan*, is that which lieth in the Bottom of the Sea.

Shares, are Goods due to more by Proportion.

FLOWER of a Plant: According to Dr. Grew, the *Flowers of Plants* have commonly these three Parts;

The *Empalement*, the *Foliation*, and the *Attire*; which Words see.

And Mr. Ray reckons, that every perfect Flower must have the *Petala*, the *Stamina*, the *Apices*, and the *Stylus*: Wherefore whatever Flower wants any of these, is to be lock'd upon as in that respect imperfect.

In most Plants there is a *Perianthium*, *Calix*, or Flower-Cup, of a stronger Consistence than the Flower it self, and design'd to strengthen and preserve it; it compasses the Flower about at the Bottom.

Mr. Ray divides also the perfect Flowers of Plants (now reckoning them perfect if they have the *Petala* without the *Stamina*) into Simple Flowers, which are not composed of other smaller ones, and which usually have but one single Style.

2. *Compounded, Aggregated, or Composite Flowers*, which are so compounded of many little *Flosculi*, as that they all make but one Flower.

Simple Flowers are *Monopetalous*, which have the Body of the Flower all of one entire Leaf, tho' sometimes cut or divided a little way into many seeming *Petala* or Leaves, as in *Borage*, *Bugloss*, &c. Or,

Polypetalous, which have distinct *Petala*, and those falling off singly, and not altogether, as the seeming *Petala* of the *Monopetalous Flowers* always do.

And both these he divides into

Uniform }
and } *Flowers*.
Difform }

The former have the right and left Hand Parts, and the forward and backward Parts of the Flower all alike.

But those he accounts to have a *Difform Flower*, which have no such Regularity; as in the *Flowers of Sage, Dead-nettle, &c.*

A *Monopetalous Difform Flower* also, he divides into,

1. *Semisiflular*; i. e. such whose upper Part resembles a Pipe cut off Obliquely, as in the *Aristolochia*.

2. *Labiata*, and this either with one Lip only, as in the *Acanthum* and *Scordium*: Or with two Lips, as in the far greatest Part of the *Labiata Flowers*. And here the upper Lip of the Flower sometimes is turned upwards, and so turns the Convex Part downwards, as in the *Chameacissus, &c.* But most usually the upper Lip is Convex above, and turns the hollow Part down to its Fellow below, and so represents a kind of *Helmet* or *Monk's Head*. And from hence these are frequently called *Galleate, Cucullate, and Galericate Flowers*, as you will find in Books of Botany: And in this Form are the *Flowers of the Lamium*, and most *Verticillate Plants*. Sometimes also the *Labium* is entire, and sometimes jagged or divided.

5. *Corniculate*; i. e. such hollow Flowers as have on their upper Part a kind of *Spury* or *Little Horn*; as in the *Linaria, Delphinium, &c.* And the *Corniculum* or *Calcar* is always impervious at the Tip or Point.

Compounded Flowers are either,

1. *Discous, or Discoidal*, that is, whose little *Flosculi* are set together so close, thick, and even, as to make the Surface of the Flower plain and flat; which therefore, because of its round Form, will be like a *Discus*: Which Disk is sometimes *Radiated*, when there are a Row of *Petala* standing round in the Disk like the Points of a Star, as in the *Metricaria, Chamaemelum, &c.*

Sometimes *Naked*; i. e. having no such radiating Leaves round the Limb of its Disk; as in the *Tanacetum*.

2. *Planifolious*, which is composed of plain Flowers set together in Circular Rows round the Center, and whose Face is usually indented, notched, uneven, and jagged; as the *Hieracia, Sonchi, &c.*

3. *Fistular*, which is compounded of many long, hollow, little Flowers like Pipes, all divided into large Jaggs at the Ends.

Imperfect Flowers, because they want the *Petala*, are called *Staminessous, Apetalous*, and *Capilla-ceous*.

And those which hang pendulous by fine Threads like the *Juli*, are by *Tournefort* called *Amentaceous*, we call them Cat's-Tails.

The same Writer uses also the Term *Campaniformis* for such Flowers as are in the Shape of a Bell; and *Infundibuliformis* for such as are in the Form of a Tunnel.

He distinguishes also some *Difform Monopetalous Flowers* by the Name of *Personati*; by which he means such as express the gaping Mouths of some *Animals*; and distinguishes these from what he calls *Labiati*, in that the *Stylus* or *Pistillum* of these doth not end in a *Capula Seminalis*, as it doth in those.



FLOWER-DE-LIS, the Mark of Difference in *Heraldry* for the Sixth Brother of any Family: 'Tis also often born as Coat Armour.

FLOWER of Sulphur or Brimstone, is made by putting the Sulphur grossly powdered into a Glass Body placed in a small open Fire, and having put over, or into its Neck, another Vessel of Earth of the same Form, but unglazed, the Fire will sublimine the Flowers, and make them adhere to the upper Vessel, which must be changed every half Hour.

FLOWERS: That fine mealy Matter which in Sublimations in Chymistry is carried up into the Head and *Aludels*, and adheres to them in the Form of a fine Powder, the Chymists call *Flores* or Flowers: See *Aludels*.

FLOWN-SHEETS: The Seamen say a Ship fails with *Flown-Sheets*, when her Sheets are not *haled home*, or close to the Blocks: They say also, *Let fly the Sheet!* When in a great Gust of Wind, for fear the Ship should over-set, or *spend* her Topmasts, they would have the Sheet *go a-main*, or as far as it will run, because then the Sail will hold no Wind; and when the Sheets are thus let go, they say, *Her Sheets are Flown*.

FLUID Body: The Excellent Sir *Is. Newton* defines a *Fluid Body* to be that whose Parts easily give Place, and move out of the way on any Force impelled upon them, and by that means do so very easily move over one another; which is a much better Definition than that of *Des Cartes*, That a Fluid is a Body whose Parts are in continual Motion; because 'tis neither apparent that the Parts of all Fluids are so; nor that the Parts of some Solid Bodies are not so.

FLUIDITY seems to consist in this, That Parts of any Bodies being very fine and small, are so disposed by Motion and Figure, as that they can easily slide over one another's Surfaces all manner of ways: It seems requisite also, as Mr. *Boyle* observes, That they should be variously and separately agitated to and fro, and that they should touch one another but in some Parts only of their Surfaces: And that Excellent Gentleman, in his History of Fluidity, intimates, That the Conditions requisite to constitute a Fluid Body are chiefly these Three:

1. The *Littleness of its Parts*: Thus we see the Fire, by dividing Metal into Parts very fine and small, will melt them, and make them Fluid. And Acid Menstruums after the same manner dissolve them and suspend them in Liquor; and Fire will turn the hard Body of common Salt almost all of it into a

Liquor, by Distillation; though 'tis not improbable, that the Shape and Figure of these small Parts may conduce much towards producing this Quality of Fluidity: For we find in the Distillation of Oil Olive (which is a Fluid made only by Pressure) that most of the Oil will be the Action of the Parts of the Fire, (note, it must be done in a Retort) be turned into a kind of consistent Substance like Butter.

2. It seems requisite to Fluidity, that there be store of vacant Places interspersed between the Corpuscles of the Fluid Body; for else there will not be room for each Particle to continue its Motion and Agitation on the Surfaces of the neighbouring ones. For,

3. The chief Condition requisite to constitute a Fluid Body, is, That its Particles be agitated variously, and apart, either by their own proper Motion, or by something of Substance which tumbles them up and down by its Passage through them. That this Qualification chiefly is requisite to Fluidity, you may gather from that common Experiment of putting Powder of Alabaster, or of common Plaster of *Paris*, finely sifted in a flat-bottom'd Vessel over the Fire; for in a little time the dry Powder will boil like Water, and imitate all the Motions of a boiling Liquor; it will tumble variously over in great Waves like that, it will bear stirring with a stick or Ladle like that, without resisting, as it will do when cold; nay, if you stir it strongly near the Side of the Vessel, its Waves will apparently dash up against the Sides; but yet if you take any of it out, and lay it speedily on a Piece of White Paper, you will see 'tis nothing but a dry Powder.

So that from hence 'tis plain, there is a real Difference between a *Fluid Body* and a *Wetting Liquor*; for not only this boiling Powder, and melted Metals, but the Air, *Aether*, and even Flame it self, are properly Fluid Bodies, though not moist Liquors.

This noble Gentleman found also, That by blowing the Smoak of Rosemary into a Glass Pipe, and then holding the Pipe (when filled) upright, the Surface of the Smoak would accommodate it self to a level Situation; and which way soever you inclined the Tube, the Superficies of the Smoak would lie parallel to the Horizon; and when the Glass was much inclined, would run along it like Water.

Whence he infers, That in order to the rendering a Body Fluid, there is no need that its Parts should be so closely condensed as those of Water are.

Dr. *Hooke*, in his *Micrograph*. P. 12. hath a pretty Experiment or Two to prove this Account of Fluidity, viz. that of a Dish of Sand set on a Drum-head briskly beaten by the Sticks, or on the upper Stone of a Mill, turning swiftly round on the (empty) lower one; it will in almost all Respects emulate the Properties of a Fluid Body. For a heavy Body will immediately sink in it to the Bottom, and a light one emerge to the Top; each Grain of Sand hath a constant vibrating and dancing Motion; and if a Hole be made in the Side of the Dish, the Sand will spin out like Water: See Vol. II.

FLUOR *Albus*, or *Fluor Uterinus*, is a continual Evacuation of corrupt Humours from the Womb, or the Pores in the *Vagina*. *Blanchard*.

FLUORES, a Word used by the Modern Mineral Writers for such soft transparent sparry kinds of Mineral Concretions, as are frequently found

found among Oars and Stones in Mines and Quarries.

FLUSH; when the Deck of a Ship is even from Stern to Stern, without any Falls or Rifings, they say her Deck lies *Flush* Fore and Aft.

FLUX and Reflux of the Sea: See *Tide*.

FLUX-POWDERS, or as the French call them, *Fondants*, are Powders prepared to facilitate the Fusion of the harder Metals, and to melt Oars in order to discover what Proportion of Metal they hold or contain.

Powder of Antimony alone is a very good Flux in many Cases, and by it you may readily melt Iron or Steel in a Crucible, with an ordinary Charcoal Fire.

Mr. Boyle gives an Account of a *Flux-Powder* he used which was composed of *Tartar*, *Sulphur*, and *Arsenick*.

FLUXION, the same with *Catarrh*.

FLUXIONS. Sir Isaac Newton, in his *Admirable Princip. Phil. Math. P. 250.* lays down this Lemma.

That the Moment of any generated Quantity, is equal to the Moments of all the several generating Terms, multiplied into the Indices of their Powers, and into their Coefficients continually.

Let a, b, c , &c. represent the Moments of any Quantities A, B, C , &c. increasing or decreasing by a perpetual Fluxion; then will the Moment or Mutation of the Rectangle AB be $Ab + aB$; and of the Content of ABC , the Moment will be $ABc + AbC + aBC$: and of the Powers A^2, A^3, A^4 , the Moments will be $2aA, 3aA^2, 4aA^3$; and the Moments of $A^{\frac{1}{2}}, A^{\frac{2}{3}}, A^{\frac{3}{4}}, A^{\frac{4}{5}}$, $\frac{1}{2}aA^{-\frac{1}{2}}, \frac{2}{3}aA^{-\frac{2}{3}}, \frac{3}{4}aA^{-\frac{3}{4}}, \frac{4}{5}aA^{-\frac{4}{5}}$, will be $\frac{1}{2}aA^{-\frac{1}{2}}, \frac{2}{3}aA^{-\frac{2}{3}}, \frac{3}{4}aA^{-\frac{3}{4}}, \frac{4}{5}aA^{-\frac{4}{5}}$, and $-\frac{1}{2}aA^{-\frac{1}{2}}, -\frac{2}{3}aA^{-\frac{2}{3}}, -\frac{3}{4}aA^{-\frac{3}{4}}, -\frac{4}{5}aA^{-\frac{4}{5}}$ respectively.

And generally, the Moment of any Power, suppose $A^{\frac{n}{m}}$, will be $\frac{n}{m}aA^{\frac{n}{m}-1}$, &c.

The Demonstration of which Lemma is this.

CASE I.

Suppose any Rectangle, as AB , made or increased by a perpetual Motion; and from the Sides AB , let there be subtracted the $\frac{1}{2}$ Moments, as $\frac{1}{2}a$ and $\frac{1}{2}b$: Then it will stand $A - \frac{1}{2}a$, and $B - \frac{1}{2}b$. Multiply them into each other, and there will arise $AB - \frac{1}{2}aB - \frac{1}{2}bA + \frac{1}{4}ab$.

Suppose also A and B increased by the half Moments, as $A + \frac{1}{2}a$, and $B + \frac{1}{2}b$; and that those thus augmented Quantities were multiplied by one another; then there will arise $AB + \frac{1}{2}aB + \frac{1}{2}bA + \frac{1}{4}ab$ for the Product: From which subtracting the former Rectangle $AB - \frac{1}{2}aB - \frac{1}{2}bA + \frac{1}{4}ab$, the Difference will be $aB + Ab$. Q.E.D. Which is the first Instance.

CASE II.

Let AB be $=$ to G : This multiplied by C , gives GC , or ABC ; and its Moment, by the last Case, will be $gC + Gc$; that is, (if instead of

G and g , you had put AB and $AB + Ab$) $aBC + AbC + ABc$. And thus it will ever be in the Quantities produced by continual Multiplication of unequal Factors.

CASE III.

Let A, B , and C , be all equal; and then the Moment of A^2 , or of the Rectangle AB , will be $2aA = aB + Ab$; and the Moment of ABC or A^3 , will be $3aA^2 = aBC + AbC + ABc$. And in the like manner if n represent the Index of any Power of A , the Moment of A^n will be naA^{n-1} . Q.E.D.

CASE IV.

Wherefore, since $\frac{1}{A}$ multiplied by $A = 1$, the Moment of $\frac{1}{A}$ multiplied by A , together with $\frac{1}{A}$ multiplied by a , will be the Moment of 1 , that is, nothing.

Further, the Moment of $\frac{1}{A^2}$ or A^{-2} , is $-\frac{2a}{A^3}$. And generally, since $\frac{1}{A^n}$ multiplied by $A^n = 1$, the Moments of $\frac{1}{A^n}$ multiplied by A^n , together with $\frac{1}{A^n}$ multiplied by naA^{n-1} , will be nothing. And consequently the Moment of $\frac{1}{A^n}$ or A^{-n} , will be $-\frac{na}{A^{n+1}}$. Q.E.D.

CASE V.

And since $A^{\frac{1}{2}}$ into $A^{\frac{1}{2}}$ produces A , the Moment of $A^{\frac{1}{2}}$ into $2A^{\frac{1}{2}}$, will be a (by Case 3.) and therefore the Moment of $A^{\frac{1}{2}}$ will be $2A^{\frac{1}{2}}$, or $2aA^{-\frac{1}{2}}$.

And generally, if $\frac{m}{A^n}$ be put equal to B , A^n shall be equal to $B^{\frac{m}{n}}$; and consequently $maA^{m-n-1} =$ to $nbB^{\frac{m}{n}-1}$, and maA^{m-n-1} equal to $nbB^{\frac{m}{n}-1}$, or $\frac{nb}{A^n}$: And therefore $\frac{m}{n}aA^{\frac{m}{n}-n-1}$ is equal to b ; $i. e.$ is equal to the Moment of $A^{\frac{m}{n}}$. Q.E.D.

CASE VI.

Wherefore the Moment of any generated Quantity $A^m B^n$, is the Moment of A^m multiplied by B^n , together with the Moment of B^n multiplied into A^m ; that is, $maA^{m-1} + nbB^{n-1}$. And this whether the Indices of the Powers be Integers or Fractions, Affirmative or Negative.

And the same Reason holds in the Products of any Numbers multiplied by themselves continually as long as you please, or to as high Powers as you will. Q.E.D.

On which Foundations the Algorithm of Fluxions, according to our way of Notation, may be thus

thus established: as I have before shewed in a good measure at the End of my *Algebra*, Pag. 115.

Where I shew, That by the Doctrine of Fluxions, we are to understand the Arithmetick of the infinitely small Increments or Decrements of indeterminate or variable Quantities; or as some call them, the Moments or infinitely small Differences of such variable Quantities. These infinitely small Increments or Decrements our incomparable Sir Isaac Newton calls very properly by this Name of Fluxions: For, as indeterminate and variable Quantities, viz. such as in the Generation of Curvilinear and other Figures, by Local Motion, are continually increasing or diminishing, he rightly denominates *Flowing Quantities*, as being such as are perpetually augmented or lessened, by the Flux or Motion of a Line, Surface, &c. So he calls the Celerity or Velocity of the Augmentation or Diminution of these *Flowing Quantities* by the Name of *Fluxions*. And because all Figures may be conceived to be generated by Local Motion, as is now very commonly supposed among Geometers, therefore 'tis much more natural to conceive the infinitely small Increments or Decrements of the variable and *flowing Quantities* under the Notion of *Fluxions*, than under that of *Moments*, or infinitely small Differences, as Leibnitz, Nieuwentijt, and the Noble Author of *Analyse des Infiniment Petits* chuse rather to take them; though even that Way also is not without its Use in many Cases.

The Excellent Sir Isaac Newton supposes the Abscissa of a Curve, or any other flowing or variable Quantity to be uniformly augmented; and therefore for its Fluxion he puts 1. or Unity; and the other flowing Quantities he denotes usually by the Letters x, y, z , and expresses their Fluxions by only repeating the same Letters with Points or

Pricks over their Heads; thus, $\dot{x}, \dot{y}, \dot{z}$, which are the Fluxions of the former flowing Quantities. And this Method is much more natural and shorter than Nieuwentijt's, or the French one with the Differential d multiplied into the flowing Quantity, to denote the Fluxion.

And because these Fluxions themselves are also Indeterminate and Variable Quantities, and do continually increase or decrease, or grow greater or lesser; therefore he considers the Velocities with which they do so increase or diminish, as the Fluxions of the former Fluxions: And those may be called *Second Fluxions*, and are noted with

Two Points over them; thus, $\ddot{y}, \ddot{x}, \ddot{z}$. And if you go on again, and consider the perpetual Augmentation or Diminution of these, as their Fluxions also, you may make third, fourth, or fifth Fluxions, &c.

which will be noted thus, $\ddot{\ddot{y}}, \ddot{\ddot{x}}, \ddot{\ddot{z}}$; $\ddot{\ddot{\ddot{y}}}, \ddot{\ddot{\ddot{x}}}, \ddot{\ddot{\ddot{z}}}$; &c. &c.

y, x, z ; and so on *ad Infinitum*. If the flowing Quantity be a Surd or a Fraction, he thus expresses its Fluxion; let the Surd be $\sqrt{a-b}$, its Fluxion

is $\frac{1}{2}\sqrt{a-b}$; and the Fluxion of the Fraction $\frac{a}{b}$ is $\frac{a\dot{b} - b\dot{a}}{b^2}$: See Dr. Wallis's *Algebra*, Lat. Edit. Pag. 392.

The main Business of the Algorithm or Arithmetick of Fluxions consists in these two Things:

I. From the Flowing Quantity given, to find the Fluxion.

II. From the Fluxion, to find the Flowing Quantity.

As to the former of these, the Learned Dr. Wallis, in the Place above-mention'd (from Sir Isaac Newton's Papers) gives this general Rule.

Let each Term of the Equation be multiplied separately by the several Indexes of the Powers of all the Flowing Quantities contain'd in that Term: And in every such Multiplication let one Root or Letter of the Power be changed into its proper Fluxion: So shall the Aggregate of all the Products connect'd together by their proper Signs, be the Fluxion of the Equation desired.

And all the Cases of it are demonstrat'd by Sir Isaac Newton in the Lemma above delivered, which I shall exemplify by particular Instances.

I. In the General; To express the Fluxions of simple variable Quantities, as was said before, you need only use the Letter or Letters which express them, with a small Point over their Heads:

Thus, the Fluxion of x is \dot{x} , and the Fluxion of y is \dot{y} , and the Fluxion of $x + y + v + z$, is $\dot{x} + \dot{y} + \dot{v} + \dot{z}$, &c.

And (inversely) the Flowing Quantities in this Case, will be easily had from the Fluxions, by only writing the Letters without the Points over them.

N. B. For the Fluxion of Permanent Quantities, when any such are in the Equation, you must imagine o or a Cypher; for such Quantities can have no Fluxions, properly speaking, because they are without Motion, or Invariable.

II. To find the Fluxions of the Products of two or more variable or flowing Quantities: Multiply the Fluxion of each Simple Quantity by the Factors of the Products, or the Product of all the rest, and connect the last Products by their proper Signs; the Sum or Aggregate is the Fluxion sought.

Thus, the Fluxion of xy is $\dot{x}y + x\dot{y}$; and the Fluxion of xyz , is $\dot{x}yz + x\dot{y}z + xy\dot{z}$; and the Fluxion of $xyyz$, is $\dot{x}yyz + x\dot{y}yz + xy\dot{y}z + xy\dot{z}$; and the Fluxion of $a + x$ by $b - y$ (the common Product being $ab - xy$) will be $b\dot{x} - y\dot{a} - x\dot{y} - y\dot{x}$.

Demonstration of Rule 2.

Suppose xy to be any Rectangle made or increased by a perpetual Motion or Fluxions of either of the Sides x or y along the other; and let the Mo-

ments or Fluxions of the Sides be \dot{x} and \dot{y} : By which we understand the Velocity with which either Side moves to form the Rectangle.

From

(for the Square of x^m is as well x^{2m} as x^{m^2}) or according to Sir *J. Newton's* Way, which is yet shorter, $\frac{m}{x^{m+1}}$: See *Case 4. P. 252.* of his *Principia*.

If the Power be Imperfect, *i. e.* if its Exponent be a Fraction, as suppose $\sqrt[n]{x^m}$; or in the other

Notation $x^{\frac{m}{n}}$, let us suppose $x^{\frac{m}{n}} = z$: Then if you raise up each Member to the Power of n , it will stand thus, $x^m = z^n$; the Fluxion of which will be, by this general Rule, $m x^{m-1} \dot{x} = n z^{n-1} \dot{z}$.

Wherefore \dot{z} will be $= \frac{m x^{m-1}}{n z^{n-1}}$ (by

dividing both Parties by $n z^{n-1}$;) and

$\frac{m}{n} x^{\frac{m}{n}-1} \dot{x}$, or $\frac{m}{n} x^{\frac{m}{n}-1} x^{\frac{m}{n}-n} \dot{x}$, by putting

instead of $n z^{n-1}$, its Value $n x^{\frac{m}{n}-n}$: So that to find the Fluxion of any kind of Power, you must proceed thus:

Multiply the Power given by its Index or Exponent, and then that Product by the Fluxion of the Root of the Power given; and after that, subtract One or Unity from the Index of the Power.

As for the Fluxions of *Surd Quantities*, Mr. *Hayes* gives the following Examples in his Treatise of Fluxions lately printed, which will make the thing plain to any one that will render himself ready at the Practice of this Art.

RULE V.

To find the Fluxions of *Surd Quantities*.

Let it be requir'd to find the Fluxion of $\sqrt[3]{2rx - xx^2}$; or $2rx - xx^2$. Suppose $2rx - xx^2 = z$; then is $2rx - xx^2 = z$; and consequently $r - x = \frac{z}{2}$; and by Division, $r - x = \frac{z}{2}$ (by Substitution)

$\frac{r - x}{2} = \frac{z}{2}$ to the Fluxion of $\sqrt[3]{2rx - xx^2}$

Let it be required to find the Fluxion of $ay - xx^3$; for $ay - xx^3$ put z , and then

$ay - xx^3 = z$, and $ay - 2xx^2 = \frac{3}{2}z - \frac{2}{3}z$:

And multiplying by 3, $3ay - 6xx^2 = \frac{3}{2}z - \frac{2}{3}z$; and consequently, $3az^{\frac{2}{3}} - 6x^2 \dot{x} = \frac{3}{2}\dot{z} - \frac{2}{3}\dot{z}$ equal (substituting $ay - xx^2 = z$) $3a^{\frac{2}{3}}y^{\frac{2}{3}} - 6a^{\frac{2}{3}}x^2y^{\frac{2}{3}} = 12ayx^2$

The Fluxions of imperfect Powers may be also investigated by (*Art. 20.*) the General Rule, and express'd otherwise, and more briefly thus:

The Fluxion of $2rx - xx^2$ is equal $\frac{1}{2} \times \frac{2r - 2x}{2} = \frac{r - x}{2}$

The Fluxion of $ay - xx^3$, is $= 3ay - xx^3$ which being reduced, will be found equal to the Fluxion thereof formerly found.

The Fluxion of $\sqrt{xy + yy}$, is $= \frac{1}{2} \times$

$xy + yy$ The Fluxion of $\sqrt{a^2 + axyy}$ is $= \frac{1}{2} \times a^2 + axyy - \frac{1}{2} \times ay^2 + 2axyy$

The Fluxion of $\sqrt{ax + xx} + \sqrt{a^2 + axyy}$ is (by the *Art. 20.* Rule, and the preceding Example)

$= \frac{1}{2} \times ax + xx + \sqrt{a^2 + axyy} + a^2 + 2ax + \frac{ay^2 + 2axyy}{2\sqrt{a^2 + axyy}}$

$2\sqrt{ax + xx} + \sqrt{a^2 + axyy} + ay^2 + 2axyy$

The Fluxion of $\sqrt{ax + xx}$, is (*Art. 14. 20.*)

(finding the Fluxions of the Numerator and Denominator) $\frac{ax - 2xx}{3\sqrt{ax + xx}} \times \sqrt{xy + yy}$

$\frac{yx + xy + 2yy}{2\sqrt{xy + yy}} \times \sqrt{ax + xx}$

To find the Fluxions of Quantities compounded of Rational and *Surd Quantities*: Let it be requir'd to find the Fluxion of $bx^2 + cax + ea^2$

$x\sqrt{xx + aa} = z$. Put $bx^2 + cax + ea^2 = p$, and $\sqrt{xx + aa} = q$. Then the given Quantity is $pq = z$, and the Fluxion thereof is $p\dot{q} + q\dot{p} = \dot{z}$. But \dot{q} is $= \frac{\dot{x}}{\sqrt{xx + aa}}$

and \dot{p} is $= 2bx + ca$; therefore in the Equation $p\dot{q} + q\dot{p} = \dot{z}$, if in place of p, q , we restore the Quantities they represent, we shall have

$\frac{bx^2 + cax^2 + ea^2xxx}{\sqrt{xx + aa}} + 2bx \times \sqrt{xx + aa} = \dot{z}$.

Which being reduc'd to one Denomination, gives $3bx^3 + 2acx^2 + ea^2x + 2ba^2x + xa^3 = \dot{z}\sqrt{xx + aa}$

$= \dot{z}$ to the Fluxion of the given Quantity.

RULE VI.

To find the Fluxions of Powers, where the Exponents of those Powers are themselves Fluent Quantities.
By Mr. Humphry Ditton, Master of the New Mathematical School in Christ's Hospital.

Let z, y, x , and v be flowing Quantities; the Varieties that may happen here, are reducible to these following Cases:

It is either $zy, zy+x, zy^x, z^y, zy^x$; in which last Case x is the Exponent of y , as y it self is also of z .

CASE I.

Let z^y be proposed, and suppose $z^y = v$, then

$z + z|y + y = v + v$, but $z + z|y + y = zy + y + yz|y + y - 1z$ (rejecting all the consequent Terms of the Series in which any Powers or Products of Fluxions would be found) ergo $v + v = zy + y + yz|y + y - 1z$, and $zy + y + yz|y + y - 1z - v = v$, but $v = z^y$; from whence $zy + y + yz|y + y - 1z - z^y = v$, is for that reason the Value of the Fluxion required.

CASE II.

2. Let $z^{y+x} = v$, then $z + z|y + y + x + x = v + v$, but $z + z|y + y + x + x = zy + y + x + x + yz|y + y + x + x - 1z$; ergo $zy + y + x + x + yz|y + y + x + x - 1z - z^{y+x} = v$.

CASE III.

3. Let $zy^x = v$, then $v + v + z + z|yx + y + x + y = zyx + y + x + y + x + yz|yx + y + x + y - 1z$, from whence arises $zyx + y + x + yz|yx + y + x + y - 1z + xyx - zyx = v$.

CASE IV.

4. Let $z^x = v$, then $v + v = z + z|x + \frac{y + yx - xy}{xx}$
 $= z + z|x + \frac{yx}{xx} = z + \frac{yx + xy - yx}{xx} + \frac{y}{x}$
 $z, \text{ thence } z + \frac{yx + xy - yx}{xx} + \frac{y}{x} - z^x = v.$

CASE V.

Lastly, Let $z^y = v$, the Fluxion of $y^x = z^{y+x} + xz^y = y - y$; ergo we have $v + v = z + z|y + y + x + x + yz|y + y + x + x - 1z$
 $= z + z|y + y + x + x + yz|y + y + x + x - 1z$
 $= z + z|y + y + x + x + yz|y + y + x + x - 1z$
 $+ yz|y + y + x + x - 1z$; and thence it is

plain; that $v = z^{y+x} + xz^y = y - y$

Next for the Rule *Inversely*, to find the Flowing Quantity belonging to the Fluxion of any Power, whether Perfect or Imperfect, proceed thus:

I. Take the Fluxionary Letter or Letters out of the Equation.

II. Augment the Index of the Fluxion by 1 or Unity.

III. Divide the Fluxion by the Index of its Power so increased by Unity.

Examples.

If $3xxx$ were proposed; by taking away x , it will be $3xx$; and by increasing its Index by Unity, it will be $3xxx$: Then dividing it by 3, its now (augmented) Index, the Quotient will be xxx , the Flowing Quantity required.

Again:

Suppose $\frac{n}{m} x^{\frac{n}{m}-1}$ a Fluxion proposed: By taking away the Fluxionary x , it will be

$\frac{n}{m} x^{\frac{n}{m}-1}$: By augmenting the Index by Unity

(i. e. taking away -1) it will be $\frac{n}{m} x^{\frac{n}{m}}$: And lastly, by dividing the remaining Part of the Fluxion by $\frac{n}{m}$, prefixed to, or multiplied into x , the

Quotient will be $x^{\frac{n}{m}}$: Which is the Flowing Quantity sought.

You will find Examples enough of this *Inverse Method*, the *Calculus Integrælis*, or *Summatory Arithmetick*, in Mr. Hayes's Book of Fluxions. Sect. 4.

Some Instances of the Proportions of Fluxions in various Curves, by Mr. H. Ditton.

Let x and v express Abscisses, y and z the Correspondent Ordinates universally: Then in the

Circle we have $y : z :: \frac{rx - xx}{y} : \frac{rv - vv}{z}$:

And supposing the Abscisse to flow uniformly, and consequently $x = v$, we have $y : z :: rz = xx :: ry - vy :: r - x :: \frac{ry - vy}{x}$; viz. the Fluxions Ce, Hi , are to one another, as BO to GO ;

the Point g being ever determined by the Perpendicular bg , let fall from b the Intersection of the Radius OG , with the Line Dh .

'Tis certain that $gO = \frac{ry - vy}{z}$, from the Similar Triangles GFO, bGO ; for $bg = DB = y$, and $z : r - v :: y : \frac{ry - vy}{z}$.

$AC = r$

Then the Rule is,

As the Sum of the Radij of both Convexities :
To the Radius of either Convexity alone ::
So is the double Radius of the other Convexity :
To the Distance of the Focus.

N. B. The Rays which fall nearer the Axis of any Glass, are not united with it so soon as those which are farther off: Nor will the Focal Distance be so great in a Plano-Convex Glass, when the Convex Side is towards the Object, as on the contrary. Wherefore that Learned Gentleman concludes truly, That in viewing any Object by a Plano-Convex Glass, the Convex Side should be turned outward: As also in burning by such a Glass, P. 25.

FOCUS Virtual: See *Virtual Focus*.

1. In Concave Glasses, when a Ray falls from Air parallel to the Axis, the *Virtual Focus*, by its first Refraction, is at the Distance of a Diameter and a Half of the Concavity.

2. In Plano-Concave Glasses, when the Rays fall parallel to the Axis, the *Virtual Focus* is distant from the Glass the Diameter of the Concavity.

3. In Plano-Concave Glasses, As 107: 193::

So the Radius of the Concavity:

To the Distance of the *Virtual Focus*.

4. In Double Concaves of the same Sphere, Parallel Rays have their *Virtual Focus* at the Distance of the Radius of the Concavity.

But whether the Concavities be equal or unequal, the *Virtual Focus*, or *Point of Divergency* of the parallel Rays is determined by this Rule:

As the Sum of the Radii of both Concavities :
Is to the Radius of either Concavity ::
So is the Double Radius of t^other Concavity :
To the Distance of the *Virtual Focus*.

5. In Concave Glasses, if the Point to which the incident Ray Converges, be distant from the Glass farther than the *Virtual Focus* of parallel Rays; The Rule for finding the *Virtual Focus* of this Ray is this;

As the Difference between the Distance of this Point from the Glass, and the Distance of the *Virtual Focus* from the Glass:

Is to the Distance of the *Virtual Focus* ::

So the Distance of this Point of Convergence from the Glass:

To the Distance of the *Virtual Focus* of this Converging Ray.

6. In Concave Glasses, if the Point to which the Incident Ray Converges, be nigher to the Glass than the *Virtual Focus* of parallel Rays; the Rule to find where it crosses the Axis is this:

As the Excess of the *Virtual Focus* more than this Point of Convergence: Is to the *Virtual Focus* ::
So the Distance of this Point of Convergence from the Glass:

To the Distance of the Point where this Ray crosses the Axis.

7. To find the Focus of a Meniscus Glass; see under the Word *Meniscus*.

Practical Rules for finding the Foci of Glasses.

For Convex Spherick Glasses.

1. For Glasses of small Spheres, (that is, of deep Convexities) apply them to the End of a Scale of Inches and Decimal Parts, and expose them before the Sun; and upon the Scale we shall find the bright Interfection of the Rays exactly measured out; or expose them in the Hole of a dark Chamber, and where a White Paper receives the distinct Representation of distant Objects, there is the Focus of this Glass. This is an universal and certain way for all Convexes.

For a Glass of a pretty long Focus, observe some distant Objects through it, and recede from the Glass till the Eye perceives all in *Confusion*, or till the Objects begin to appear *Inverted*; here the Eye is in the Focus.

If it be a *Plano-Convex Glass*, make it reflect the Sun against a Wall; we shall on the Wall perceive two Sorts of Light; one more *bright*, within another more *obscure*; withdraw the Glasses from the Wall till the *bright* Image is at its smallest, the Glass is then distant from the Wall about the fourth Part of its Focal Length.

If it be a *Double Convex*, expose each Side to the Sun in like manner, and observe both the Distances of the Glass from the Wall. The first Distance is about half the Radius of the Convexity turned from the Sun; and the second Distance is about half the Radius of t^other Convexity likewise: Thus we have the Radii of the two Convexities; whence the Focus is found by this Rule;

As the Sum of the Radii of both Convexity :
To the Radius of either Convexity ::
So is the Double Radius of the other Convexity
To the Distance of the Focus.

The *Foci* of Concaves are obtain'd by Reflection; for as a *Concave Mirror*, or *Speculum*, burns at the Distance of about half the Radius of the Concavity; so a *Concave Glass*, being supposed a *Reflecting Speculum*, shall unite the Rays of the Sun at the Distance of about half the Radius of the Concavity.

Mr. Halley's Doctrine of the Foci of Spherical Glasses of all Sorts, exposed either to Diverging, Converging, or Parallel Rays, is as follows: See Appendix to *Molyneux's* Dioptricks.

PROPOSITION.

To find the Focus of any Parcel of Rays Diverging from, or Converging to a given Point in the Axis of a Spherical Lens, and inclined thereto under the same Angle, the Ratio of the Sines in Refraction being known.

Let *G L* be the Lens.

P any Point in its Surface.

V the Pole thereof.

C the Center of the Sphere whereof it is a Segment.

O the Object or Point in the Axis, to or from which the Rays do proceed.

O P a given Ray.

Let the Ratio of Refraction be as *r* to *s*: Make *C R* to *CO*, as *s* to *r*, for the *Immerision* of a Ray;
or

or as r to s for the *Emission*; (that is, as the Sines of the Angles in the Medium which the Ray enters, to their corresponding Sines in the Medium out of which it comes.)

And laying CR from C towards O , the Point R shall be the same for all the Rays of the Point O .

Then draw the Radius PC , if need be, continued; and with the Center R , and Distance OP , sweep a touch of an Arch intersecting PC in Q : The Line QR being drawn, shall be parallel to the Refracted Ray; and PF being made parallel thereto, shall intersect the Axis in the Point F , which is the Focus sought.

Or make it, As $CQ : CP :: CR : CF$, and CF shall be the Distance of the Focus from the Center of the Sphere.

Demonstration.

Let fall the Perpendiculars Px on the Axis, Cy on the given Ray, and Cz on the refracted Ray.

Then PF and QR are parallel by Construction, whence the Triangles QRC and PFC are similar.

$$\text{And } CR : QR :: CF : PF;$$

$$\text{That is, } CR : OP :: CF : PF.$$

$$\text{Now } CF : PF :: Cz : Px \text{ ob sim. Tri.}]$$

$$\text{Whence } CR : OP :: Cz : Px$$

$$\text{And } CR : Cz :: OP : Px$$

Again, $CR : CO ::$ As the Sines of Refraction, by Construction; that is, as s to r , or r to s ; and

$$\text{as } CR : Cz :: CO = \frac{r}{s}, \text{ or } -CR : - \text{ or } -Cz,$$

$$:: PO : Px.$$

$$\text{But } PO : Px :: CO : Cy,$$

$$\text{Therefore } Cy = \frac{r}{s} \text{ or } -Cz;$$

That is, $Cy : Cz ::$ As the Sines of Refraction.

But $\{Cy\}$ is the Sine of the $\{$ Angle of Incidence.

$Q. E. D.$

The several Cases of Rays Diverging or Converging, as they enter the Curve Surface of a *Convex* or *Concave Lens*, are for the Reader's Ease delineated in Fig. 1, 2, 3, 4: And the like Cases of *Emerging Rays* in Fig. 5, 6, 7, 8:

Fig. 1

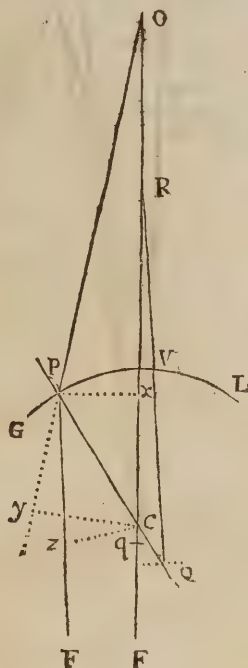


Fig. 2.

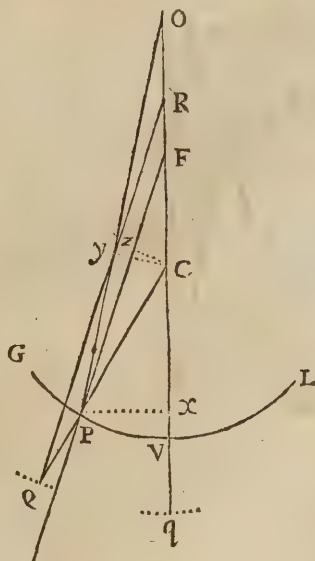


Fig.

Fig. 3.

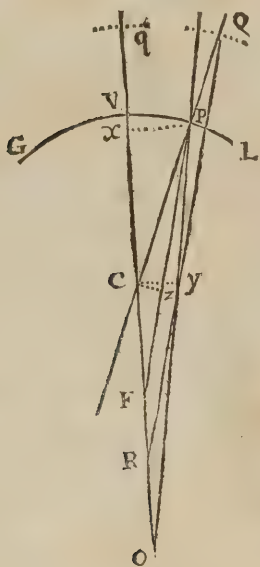


Fig. 5.

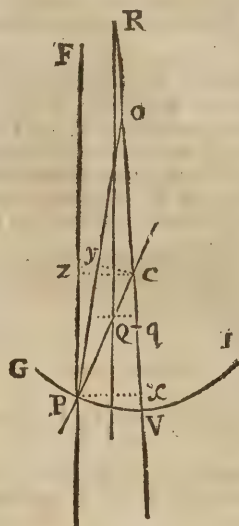


Fig. 4.

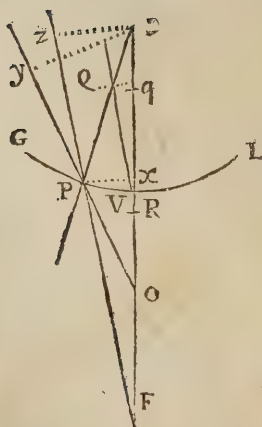


Fig. 6.

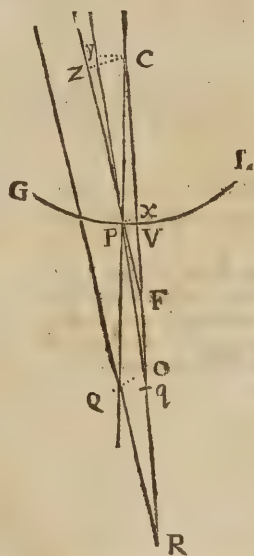


Fig. 7.

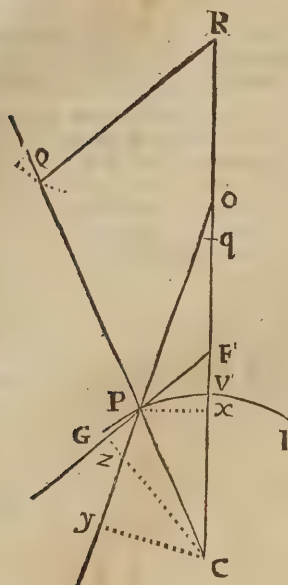
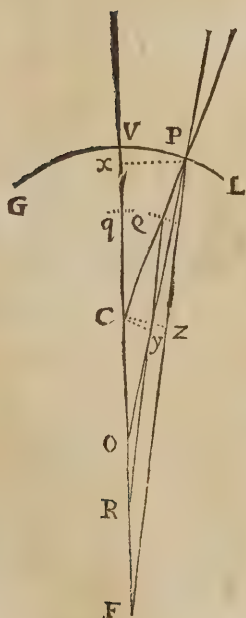


Fig. 8.



All which are drawn with the same Letters to their respective Points, only in some the Point F falling far distant, is to be understood in the Intersection of the Line PF with the Axis.

This thus demonstrated, in the most difficult Cases will give all the Rules for the Foci of Rays parallel to the Axis, as likewise for the principal Focus, where the Rays nearest the Axis do unite: All which Rules are collected in these following Corollaries.

COROLLARY I.

If OP be equal to CR , then the Points Q and C are coincident, and the Rays OP , after Refraction, run on parallel to the Axis.

COROLLARY II.

If the Point Q fall on the same Side of the Axis, as is the Point P , then the Beams after Refraction do tend on, either Diverging or Converging, as before: But if Q fall on the other Side the Axis, as in Fig. 1. the Diverging Rays are made to Converge by a *Convex*, or the Converging to Diverge by a *Concave* Glasse.

COROLLARY III.

If OP do exceed CR , the Focus is in all Cases on the same Side of the Glasse as is the Center of the Sphere C .

But contrariwise, if OP be less than CR , the Focus falls on the other Side of the Glasse beyond the Vertex V .

COROLLARY IV.

An Object may be so placed, that the Rays next the Axis of a *Convex* Glasse shall have an Imaginary Focus transmitting Diverging Rays, when the more remote Parts thereof shall make them Converge to a real Focus.

COROLLARY V.

If OV the Distance of the Object from the Pole or Vertex of the Glasse, be taken instead of OP , then will CQ be the Difference of OV and CR ; and as that Difference is to CR , so is the Radius CV , to CF , the Distance of the principal Focus from the Center of the Sphere, whereof the Glasse is a Segment.

Or else, As CQ : To OP or RQ :: So PC : To VF , the Focal Distance from the Pole of the Glasse.

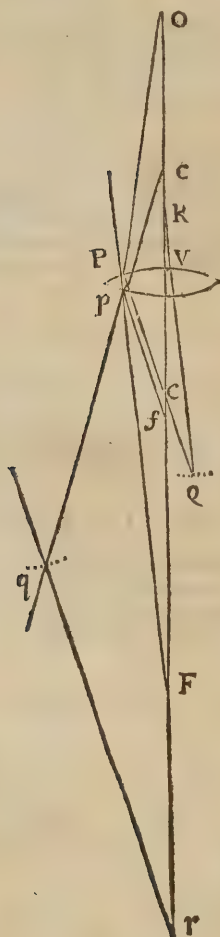
Whence follows a General Rule for the Foci of all Glasses, only according to Cor. 3. if OV do exceed CR , the Focus is on the same Side of the Glasse, as the Center of the Sphere: But if CR be greater, then the Focus is on the opposite Side of the Glasse; whence it will be determined, whether the Focus be real or Imaginary.

COROL-

COROLLARY VI.

What has been said of one Surface of a *Len*, is easily applicable to the other; taking *F*, the Focus of the first Surface, as an Object, and using it as *O* in the Figures for Emerging Rays; whereby the Focus of both Surfaces will be determined, as in Fig. 9.

Fig. 1.



COROLLARY VII.

Hitherto we have considered only *Oblique Rays*, either Diverging or Converging: It now remains to add something concerning *Rays parallel* to the *Axis*.

In this Case the Point *O* must be considered as infinitely distant; and consequently *OP*, *OC*, and *CR*, are all infinite; and *OP*, *OC* are in this Case to be accounted always equal, (since they differ but by a part of the Radius of the Sphere *GPVL*, which is no part of either of them;) wherefore the *Ratio* of *CR* to *OP* will be always the same, viz. as *s* to *r* for Immerging Rays, and as *r* to *s* for those that Emerge; and by this Proposition, *CF* is to *PF* in the same *Ratio*.

This Problem has been very fully considered by the celebrated *Dr. Wallis*, in his *Treatise of Algebra*, Pag. 258, but the Construction thereof must be repeated here: See Fig. 1. preceding, and this following one.

Fig. 2.

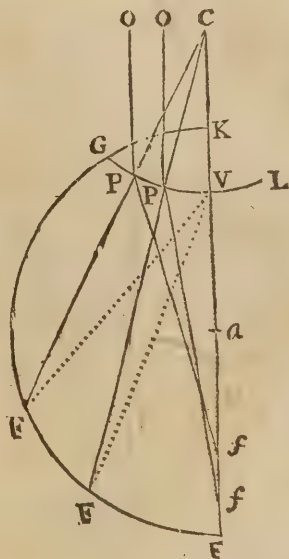
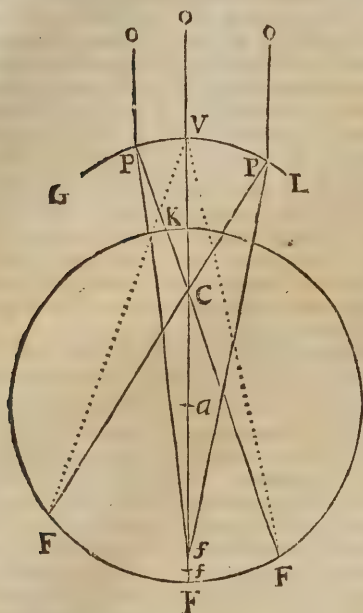


Fig. 2.



Let $GPVL$ be a *Lenz*, VC or PC the Radius of its Sphere; and let it be required to find all the Points f, f, f so as Cf , may be to Pf , in the given Ratio as s to r for Immersing Rays, or as r to s for the Emerging.

Divide CV in K , and continue CV to F , that CK may be to VK , as CF to VF in the proposed Ratio: Then divide KF equally in the Point a ; and with that Center sweep the Circle FKF ; this Circle being drawn, gives readily all the Foci of the parallel Rays OP, OP : For having continued CP till it intersect the Circle in F , PF shall be always equal to Vf , the Distance of the Focus of each respective Parcel of Rays OP , from the Vertex or Pole of the *Lenz*.

Demonstration.

Draw the prick'd Line VF , and by what is delivered by Dr. Wallis in the afore-cited Place, VF and CF will be always in the same proposed Ratio.

Again, Vf being made equal to PF , CF and Cf will be likewise equal, as are CP and VC ; and the Angles PCf , VCf being *ad verticem*, are also equal: Wherefore Pf will be equal to VF , and consequently Cf to Pf in the same Ratio as CF to VF ; whence, and by what foregoes, the Points f, f, f are the several respective Foci of the several Parcel of Rays OP, OP, Q, E, D .

That CF is to PF in the Ratio of the Refraction in the Case of parallel Rays, will yet be more evident, if it be considered, that the Angle at C is equal to the Angle of Incidence, and the Angle at P to the Refracted Angle; wherefore PF the Side opposite to the Angle at C , is as the Sine of the Angle of Incidence; and CF opposite to the Angle at P , is as the Sine of the respective refracted An-

gle. Whence in all Cases of parallel Rays, CF is to PF in the same constant Ratio of Refraction.

If it shall be desired to effect in Numbers what we have here done by Lines, it will be most easy to adapt a Calculus to the foregoing Geometrical Construction.

For if in the Triangle POC , there be given the Radius CP equal to Unity, CO the Distance of the Object from the Center of the Sphere, and the Perpendicular Px , equal to the Sine of the Angle PCO , the Side $PO = QR$ will be equal to

$$\sqrt{CO^2 + CP^2} + 2CO \sin \sqrt{CP^2 - Px^2}.$$

Then, As QR or PO : To Px :: So CR : To the Sine of the Angle CQR , and the Complement to 180 Degrees of the Sum of the Angles CPO and CQR , is the Angle CRQ equal to CFP ; and as Px : To PO :: So is the Sine of the Angle CRQ : To CQ ; and as CQ : To CP :: So CR : To CF , which is the Distance of the respective Focus of all the Rays PO , from the Center of the Sphere C .

But the Foci of Rays parallel to the Axis may be computed more readily, following the Footsteps of the Construction; for thereby it will appear, that the Radius of the Circle FKF , viz. aF , is equal to $\frac{rs}{rr - ss} CP$, and $Ca = \frac{rr}{rr - ss} CP$, for Emerging Rays, as in Fig. 1. but for Immersing Rays, as Fig. 2 a will be found to be $\frac{ss}{rr - ss} CP$: And supposing the Distance of the Rays from the Axis = Px in the Case of parallel Rays Emerging, the Distance of the Focus will be found,

$$PF = \frac{rr}{rr - ss} \sqrt{CP^2 - Px^2} + \sqrt{\frac{rs}{rr - ss} CP^2 - \frac{rr}{rr - ss} Px^2} - CP:$$

That is, r to s being as 3 to 2.

$$PF = \frac{2}{3} \sqrt{CP^2 - Px^2} + \sqrt{\frac{2}{3} CP^2 - \frac{2}{3} Px^2} - CP.$$

And for Immersing Rays, the Focal Distance is found by a like Rule:

$$PF = \frac{ss}{rr - ss} \sqrt{CP^2 - Px^2} + \sqrt{\frac{rs}{rr - ss} CP^2 - \frac{ss}{rr - ss} Px^2} + CP.$$

That is, r and s being as 3 to 2, as before.

$$PF = \frac{2}{3} \sqrt{CP^2 - Px^2} + \sqrt{\frac{2}{3} CP^2 - \frac{2}{3} Px^2} + CP.$$

These Canons are so easily deduced from the Constructions, that there is no need to trouble the Reader with their Demonstrations, only you have here added two Tables computed from them, with little more Work than a continual Addition; which may, by way of Example, serve to instruct and exercise the young Student in this Part of the Mathematicks.

Suppose CP the Radius of the Sphere of Glass 2 Inches, and the Ratio of Refraction as 3 to 2; at each Tenth of an Inch distance from the Axis the Foci are as follows.

55
For

For Emerging Rays.

Px	P F
0	$\sqrt{12.9600} + \sqrt{5.7600} + 2$
1	$\sqrt{12.9276} + \sqrt{5.7276} - 2$
2	$\sqrt{12.8304} + \sqrt{5.6304} - 2$
3	$\sqrt{12.6684} + \sqrt{5.4684} - 2$
4	$\sqrt{12.4416} + \sqrt{5.2416} - 2$
5	$\sqrt{12.1500} + \sqrt{4.9500} - 2$
6	$\sqrt{11.7936} + \sqrt{4.5936} - 2$
7	$\sqrt{11.3724} + \sqrt{4.1724} - 2$
8	$\sqrt{10.8864} + \sqrt{3.6864} - 2$
9	$\sqrt{10.3356} + \sqrt{3.1356} - 2$
10	$\sqrt{9.7200} + \sqrt{2.5200} - 2$

For Immerging Rays.

Px	P F
0	$\sqrt{2.5600} + \sqrt{5.7600} + 2$
1	$\sqrt{2.5536} + \sqrt{5.7536} + 2$
2	$\sqrt{2.5344} + \sqrt{5.7344} + 2$
3	$\sqrt{2.5024} + \sqrt{5.7024} + 2$
4	$\sqrt{2.4576} + \sqrt{5.6576} + 2$
5	$\sqrt{2.4000} + \sqrt{5.6000} + 2$
6	$\sqrt{2.3296} + \sqrt{5.5296} + 2$
7	$\sqrt{2.2464} + \sqrt{5.4464} + 2$
8	$\sqrt{2.1504} + \sqrt{5.3504} + 2$
9	$\sqrt{2.0416} + \sqrt{5.2416} + 2$
10	$\sqrt{1.9200} + \sqrt{5.1100} + 2$

But it is to be noted, That these *Foci* for Immerging Rays must not be taken for the *Foci* of a Plano-Convex, when the Convex-side is towards the Object; for the Plane-side, by its Refraction, does contract the Focal Length by about a Semidiameter of the Sphere; these suppose the Body of Glass continued.

The same Ingenious Author, as an Instance of the Excellence of the *Modern Algebra*, gives also in *Philos. Trans.* N. 205. a Way to find the *Foci* of all Optick Glasses universally; and shews of what great Use his and such Theorems are: But having enlarged so much already, I can only refer the *Algebraical Reader* thither, where he will find sufficient Satisfaction.

FODINA, is the Labyrinth in the Bone of the Ears.

FÆCULA, signifies a Powder which subsides to the Bottom in certain Strainings of Vegetables; for it is prepared of some green, washed, and pared Roots beat together with a little Water, then strained, that there may subside a white sort of Powder, which is to be dried lightly.

FOETUS, is the Young of all kind of Creatures, more especially Human; immediately after the Conception it is called an *Embryo*; but when its Formation in the Womb is perfectly finished, it is properly termed the *Fetus*.

Dr. Drake, in *Phil. Trans.* N. 281, ingeniously tells us, That the Nourishment of the *Fetus* in the Womb (which he makes to have a little more than Vegetative Life, and to be a Graft, as it were, upon

the Stock of the Mother) is by Transfusion of the Blood from the Hysterick Arteries, immediately to the Umbilical Vein, together with such Nutritious Juices and Aerial Particles as the Blood is supposed to carry along with it: By which Means so much of the Impulse of the Mother's Blood is preserved, as is sufficient to maintain that Languid Circulation which the *Fœtus* enjoys; for the Blood being driven through the Arteries of the Uterus into the Umbilical Vein, is conveyed directly to the *Sinus* of the *Porta*, and thence; by a short and direct Passage, thro' the *Cava* to the Heart; where passing thro' the *Foramen Ovale* to the *Left Ventricle*, and thro' the *Canalis Arteriosus* from the *Right* and *Pulmonary Artery*, it is all delivered, without coming at the Lungs, to the *Aorta*; and from thence again, by the Umbilical Arteries to the Veins of the Uterus, making a sort of *Epicycle* to the main Circulation in the Mother.

And this is confirmed by the Experiments of the Accurate Mr. Cowper, who, by pouring Mercury into a Branch of the Uterine Artery of a Cow, that went into one of the *Cotyledones* of the Uterus, filled with that Metal those Branches of the Umbilical Veins, which went from the *Cotyledon* to the Navel of the *Fœtus*.

FOLIAGE, the branched Work in Tapestry or Painting; also a kind of Ornament used in Cornices, Frizes, Capitals of Pillars, and other Members of Architecture; some of which represent the Leaves of the Herb *Brank-Ursine* or *Bear's-Foot*; and others those of divers sorts of Trees, as the *Oak*, *Laurel*, *Olives*, *Vine*, &c.

FOLIATE; to *foliate* Looking Glasses, is to spread a Composition of something which will firmly adhere to the Back of the Glass, and there reflect the Image. This is called the *Foile*, and is usually made with Quicksilver mix'd with some other Ingredients.

FOLIATION, according to Dr. Crew, is one of the Parts of a Flower of a Plant, being the Collection of those Fogacious Coloured Leaves (in *Latin Petala*) which constitute the Compass of the Flower; and also, sometimes to secure and guard the Fruit which succeeds the *Foliation*, as in Apples, Pears, &c. and sometimes stands within it, as in Cherries, Apricots, &c. for these being of a very tender and pulposus Body, and coming forth in the colder Part of the Spring, would be often injured by the Extremities of Weather, if they were not thus protected and lodged up within their Flowers.

The *Foliation* also is serviceable to the Growth of the Fruit in its Infancy or Embryo-State, being always proportionable to the Nature of the Fruit, and to the Plenty of the Sap by which the Fruit is fed or supplied. *Anat. of Plants*, P. 37.

The Doctor observes, That the Flowers of all Plants are perfectly formed or finished in all their Parts long before they appear in Sight, usually 2 or 3 Months, and sometimes Half a Year or more: And though usually the Flower appear before the Seed, yet is the Seed first formed, and then the Flower.

FOLLICULUS, a Term in Botany, signifying the Seed-Vessel, *Cassula Seminaria*, the Cale, Husk, Coat, or Cover, which some Fruits and Seeds have over them; as that of the *Alkchango*, the *Pedicularis*, &c.

FOLLICULUS Vellis, or *Vesica Biliaris*, is a little Bladder fastned to the Concave Part of the Liver, and receives the Bile, which in Proccels of Time empties

empties it self into the Gut *Duodenum*, by a Ductus or Passage called *Choledochus ductus*.

FOMAHANT, a Star of the first Magnitude in *Aquarius*, whose Longitude is 329 Degrees 17 Minutes, Latitude 21 Degrees 3 Minutes.

FOMENTATION, is the bathing of any Part of the Body with a convenient Liquor; which is usually a Decoction of Herbs in Water, Wine, or Milk: Also applying of Bags stuffed with Herbs and other Ingredients, which is commonly called a *Dry Fomentation*.

FONTANELLE, or *Issues*, are little Ulcers which Surgeons make in found Parts of the Body, to evacuate Humours, cure Diseases, or prevent them. *Issues* are made either with an actual or a potential Sealing-Iron, with a Lancet, and a Pair of Scissors, &c. You must always observe to make *Issues* betwixt two Muscles. *Blanchard*.

FORAMEN Lacrymale: See *Lacrymale Punctum*.

FORCE, in Common Law, signifies an Offence, by which Violence is used to Persons or Things; and is either *Simple* or *Compound*.

Simple Force, is that which is so committed, that it hath no other Crime adjoined to it: As if one by force do enter into another Man's Possession without doing any other unlawful Act.

Mist or Compound Force, is that Violence which is committed with such a Fact, as of it self only is Criminal; as if any by force enter into another Man's Possession, and to kill a Man, or ravish a Woman there, &c.

Force is also divided into true *Force*, and *Force* after a sort, with several other Branches; as *forcible* Entries, *forcible* Detaining, unlawful Assembly, Riots, Riots, Rebellions, &c.

FORCEPS, is an Instrument wherewith dead and corrupt Parts (also things besides or against Nature) are seized, cut off, or pulled out; they are of several Shapes, as long, crooked with Teeth, with Beaks, in fashion of an Half-Moon, such as will open the Mouth or the Womb, and by which you may see into either of them; which, according to the Difference of their Shape, are of different use. *Blanchard*.

FORCIBLE detaining or holding of Possession, is a violent Act of Resistance by strong Hand of Men weapon'd with Harnes, or other Action of Fear in the same Place, or elsewhere, whereby the lawful Entry of Justices or others is barr'd or hinder'd.

FORCIBLE Entry, is a violent actual Entry into a House or Land, &c. or taking a Distress of any Person weapon'd, whether he offer Violence, or Hurt to any there, or furiously drive any out of the Possession thereof.

FORE CASTLE of a Ship, is that Part where the Fore-Mast stands, and 'tis divided from the rest of the Floor by a Bulk Head; that Part of the *Fore-Castle* which is aloft, and not in the Hold, is called the *Prov*.

FOREFOOT, a Sea Term for one Ship's lying or sailing cross anothers way; as if two Ships being under Sail, and in ken of one another, one of them lies in a Course, with her Stem so much a Weather the other, that if they both hold on their Course, the Windward Ship will run or go out a-head of the other; and then they say such a Ship lies with the others *Fore-foot*, tho' as soon as she has passed her, or gone out before her a-head, they do not say, she passed by her *Forefoot*, but that she is *gone out a-head*.

FOREJUDGED the Court, is when an Officer of any Court is expelled the same for some Offence, or for not appearing to an Action by Bill filed a-

gainst him; and in the latter he is not to be re-admitted till he shall appear, but shall lose his Office, and be *Forejudged the Court*.

FOREJUDGER, in Law, signifies a Judgment, whereby a Man is deprived, or put by the thing in question.

FORELAND, a Term in Fortification, the same with *Berne*.

FORELOCKS, in a Ship, are little flat Wedges like pieces of Iron, used at the ends of Bolts, to keep the Bolts from flying out of the Holes: They are used also to keep fast down the Cap-squares of the Carriages for the Guns; these are also called *Fore-lolocks*.

FORE-MAST of a Ship, is a round large piece of Timber, seated in her fore-part or Fore-castle, on which is born the Fore-sail and Foretop-sail-Yards. Its Length is usually $\frac{2}{3}$ of the *Main-mast*; the Foretop-mast is half the Length of the Fore-mast, and the Foretop-gallant-Mast is half the Length of the Foretop-mast.

FORE-REACH; the Seamen say one Ship *fore-reaches* upon another, when both Sailing together, she sails better or out-goeth the other.

FORE-STAFF: See *Cross-staff*, being an Instrument used at Sea, for taking the Altitude of the Sun, Moon, or Stars, with ones Face towards the Object.

FOREIGN, is in Law used adjectively, being joyned with divers Substantives in several Senses: As,

FOREIGN Answer, is such an Answer as is not triable in the County where it is made.

FOREIGN Attachment, is an Attachment of Foreigners Goods found within a Liberty or City, in the Hands of a third Person, for the Satisfaction of some Citizen, to whom the said Foreigner oweth Money.

FOREIGN Matter; that is, Matter triable in another County.

FOREIGN Opposer, or *Apposer*, is an Officer in the *Exchequer*, to whom all Sheriffs and Bayliffs do repair to be apposed by him of their Green Wax, after they are apposed of their Sums out of the Pipe-Office; and from thence draws down a Charge upon one of them to the Clerk of the Pipe: His Business is to examine the Sheriffs Estreats with the Record, and to ask the Sheriff, what he says to every particular Sum therein.

FOREIGN Plea, is a Refusal of the Judge as Incompetent, because the Matter in Hand was not within his Precinct.

FOREIGN Service, is such Service whereby a mean Lord holdeth over of another, without the Compass of his own Fee; or else that which a Tenant performeth either to his own Lord, or to the Lord Paramount out of his own Fee.

FOREST, is a large Wood privileged to hold the King's Game of all kind.

The Properties of a Forest are these;

First, A Forest, as it is truly and strictly taken, cannot be in the Hands of any but the King, for none hath Power to grant Commission to be a Justice in *Eyre*, or the Forest, but the King.

The second Property consists in the Courts, as the *Justice-Seat* every three Years, the *Swain-mote* thrice every Year, and the *Attachment* once every forty Days.

The Third Property, are the Officers belonging to it, for the Preservation of the Vert and Venison; as the Justices of the Forest, the Warden or Keeper, Verderers, Foresters, Agistors, Regarders, Bayliffs, Beadles, and such like.

FORESTER, is a Sworn Officer of the Forest, appointed by the King's Letters-Patent to walk the Forest both early and late, watching both the Vert and Venison, attaching and presenting all Trespassers against them within their own Balywick or Walk: And tho' these Letters-Patents be ordinarily granted but *quam diu se bene gesserint*; yet some have it to them and their Heirs, and thereby are called *Foresters in Fee*.

FORFEITURE, in our Language, signifies rather the Effect of transgressing a Penal Law, than the Transgression it self, as Forfeiture of Escheats.

FORFEITURE of Marriage, is a Writ lying against him, who holding by Knights Service, and being under Age, and Unmarried, refuses her whom the Lord offers him with his Disparagement, and Marrieth another.

FORFEX, is an Instrument to pull out Teeth with.

FORGERY: See the next following, *viz.*

FORGER of False Deeds, in Law, signifies either him that fraudulently maketh and publisheth *False Writings*, to the Prejudice of any Man's Right; or else the Writ that lieth against him that committeth this Offence, which by some is called, *The Writ of Deceit*.

FORELORN-HOPE, or the *Enfans Perdue* in an Army.

FORM of any Natural Body, is the Essential, Specific, or distinguishing Modification of the Matter of which it is composed, so as thereby to give it such a peculiar manner of Existence: And this is an Aggregate or Convention of as many particular Qualities, as serve to denominate the Body of such a Nature, and to give it such a Name, and which distinguishes it from other Bodies. Thus the Qualities of greatest Specific Gravity, Fixity in the Fire, Ductility under the Hammer, Paucity and yet Largeness of Pores, Dissolubility in *Aqua Regia* and not in *Aqua fortis*, and Yellowness of Colour, make up the Form of that Metal which we call Gold. So that 'tis not any kind of substantial Soul or Substance distinct from Matter, but only such a proper and agreeable Convention of Accidents, as by common consent are reputed sufficient to make a Portion of Universal Matter, belong to this or that Determinate Genus or Species of Natural Bodies. But yet some are of Opinion, That the Human Soul may properly enough be called, a *Substantial Form*.

FORMED Stones, are with the Writers of Natural History, such Bodies as being either pure Stone, Flint, or Sparr, are found in the Earth so formed, as that they bear a near Resemblance to the external Figure and Shape of Muscles, Cockles, Periwinkles, and other Shells. There hath been a great Dispute amongst the Naturalists, how these Bodies came thus formed, and a great many have been very fond of (what appears to me as a very absurd Opinion) *viz.* That these are only a *Lusus Naturæ*, only the Sports and Diversions of Nature, to make her self Merry in the dark Regions of the Earth. But Dr. Woodward, in his Natural History of the Earth, advances a very fair Solution of this Difficulty, and proves, that these formed Stones, by the Dissolution of the Earth at the Deluge, were then made by being cast into the Cavities of those Shells which they represent, the Shells serving as Moulds to give them their proper form.

FORMEDON, is a Writ that lies for him that hath Right to any Lands or Tenements, by Vertue of an *Entail*: It lieth in three sorts;

1. *Formedon in the Descender*, which lieth for the Recovery of Lands, &c. given to one and the Heirs

of his Body, or to a Man and his Wife, and the Heirs of their Bodies, or to a Man and his Wife being Cousin to the Donor in *Frank-Marriage*, and afterwards alienated by the Donee; for after his Decease, his Heirs shall have this Writ against the Tenant or Alliance.

2. *Formedon in the Reverter*, lieth for the Donor or his Heirs, where Land entail'd to certain and their Issue, with condition for want of such Issue, to revert to the Donor and his Heirs, against him to whom the Donee alienateth, after the Issue extinct to which it was entail'd.

3. *Formedon in the Remainder*, lieth where a Man giveth Lands in Tail, the Remainder to another in Tail; and afterwards the former Tenant in Tail dieth without Issue of his Body, and a Stranger abateth, then he in the Remainder shall have this Writ.

FORMEE, the Term sometimes used for the *Crofs Patee* in Heraldry: See *Patee*.

FORMER, is the Name of a piece of Wood turn'd round and fitted to the Bore of a Piece of Ordnance, on which are founded the Cartridges which hold the due Charge of Powder for the Gun.

FORMULÆ, is the Word used for the Physician's Prescriptions. *Blanchard*.

FORNIX, is the Callous Substance of the Brain, so called, because it seems to sustain the Cavities of the Ventricles, and the Bulk of the impending Brain, like an Arch or Vault.

FORESTAL, is to be quit of Amerciaments and Cattle arrested within your Land, and the Amerciaments thereof coming.

FORESTALLING, signifies the Buying or Bargaining for any Victuals or Wares coming to be sold towards any Fair or Market, or from beyond the Seas towards any City, Port, Haven, Creek, or Road of this Realm, and before the same be there, to the intent to sell the same again at a higher and dearer price.

FORT, is a Castle, or a place of small extent, fortified either by Art or Nature.

FORT-ROYAL, is that which hath 26 Fathoms for the Line of Defence.

FORT-STAR, is a Redoubt, constituted by Re-entring and Salient Angles, which commonly have from 5 to 8 Points: See more under the Word *Sconces*.

FORTIFICATION, or *Military Architecture*, is an Art shewing how to fortifie a place with *Ramparts*, *Parapets*, *Moats*, and other *Bulwarks*, to the end, that a small number of Men within may be able to defend themselves for a considerable time against the Assaults of a numerous Army without; so that the Enemy in attacking them must of necessity suffer great loss.

Fortification is either *Regular* or *Irregular*, and with respect to Time, may be distinguish'd into *Durable* and *Temporary*.

Regular Fortification, is that which is built on a *Regular Polygon*, the Sides and Angles whereof are all equal; being commonly about a Musket-shot one from another.

Irregular Fortification, is that where the Sides and Angles are not at all uniform, equi-distant, nor equal one to another.

Durable Fortification, is that which is raised to continue a long while.

Temporary Fortification, is that which is erected upon an emergent occasion for a little time; such are all sorts of Works cast up for the seizing or maintaining

taining of a Post or Passage, as also *Circumvallations*, *Contravallations*, *Redoubts*, *Trenches*, *Batteries*, &c.

The principal Maxims of Fortification, are these:

1. Every Place within the *Fortification* ought to be flank'd; that is, seen sidewise, or defensible from the other Parts, so that there may be no Place in which an Enemy can lodge himself undiscovered by those that are within, and that both from the Front, the Sides, even from Behind if possible.

2. The Forts ought to command all Places round about; and therefore all the Out-works must be lower than the Body of the Place.

3. The Works that are most remote from the Center of the Place, ought always to be open to those that are more near.

4. The *Angle Flanquant*, or the Point of the *Bastion*, ought to be at least of 70 Degrees, or as some say (Mr. *Vauban*) not more than 100, or less than 60.

5. The *Angle of the Courtine* ought never to be less than 90, or greater than 100 Degrees, because if it be larger, 'tis too much subject to the View of the Enemy.

6. The greater the *Flank* and *Demigorge* is in Proportion to other Things, the better; because there is both more Room to retrench in, and also because there may be made retiring Flanks, which add very much to the Strength of a Place.

7. The *Line of Defence* ought never to exceed Point-blank Mullet-shot, which is about 120 or 125 Fathoms.

8. The *Bastions* that are not too little, nor yet too excessively big, are to be preferred before others; and the Angle of a *Bastion* should not exceed 100, nor be less than 60 Degrees.

9. The greater the *Angle* that is made by the outward *Polygon* and the Face shall be, the greater is the Defence of the Face.

10. Whatsoever incloses a durable *Fortification*, must be either *Flank*, *Face*, or *Curtain*; and built so well, that the first Discharge of the Cannon may not be able to pierce through it.

11. 'Tis impossible to fortify a Triangle after the common Way, because the Angle of the Gorge is always less than 90 Degrees.

12. The Acuter the Angle at the Center is, the Place is by so much the stronger, because it will have the more Sides.

13. In a *Regular Fortification* the Face must never be less than half the *Curtain*; and the Faces of the *Bastion* ought to be defended by the Small Shot of the opposite Flanks.

14. *Dry Trenches* are preferable to those filled with Water, especially in great Places, where *Salies*, *Retreats*, and *Succours* are frequently necessary; but in small Fortresses, *Water Trenches* that cannot be drained are best, because there is no need of *Salies*, *Succours*, &c.

FORTINS, or *Field-Forts*, are Sconces or little Fortresses, whose *Flank'd Angles* are generally distant one from another 120 Fathom, but their Extent and Figure are different, according to the Situation or Nature of the Ground; some of them having whole *Bastions*, and others only *Demi-Bastions*. They are made use of only for a Time, either to defend the Lines of *Circumvallation*, or to guard some Passage or dangerous Post.

FOSSILS; all Bodies whatever that are dug out of the Earth, are by Naturalists commonly treated of under this general Title of *Fossils*: But these may be distinguished into two Classes.

First, Such as are Natives of the Earth: Or, *Secondly*, Such as are *Adventitious*, and repositied in the Earth by the *Universal Deluge*, or by some other means.

Of which latter Sort are the *Exuvia* of Sea and Land Animals; the *Fossil-Shells*, *Bones*, *Teeth*, &c. which are plentifully found in the Earth, and by some Writers have been erroneously thought a sort of Stones that are peculiar, and as they speak, *sui Generis*.

The following Table of such *Fossils* are as *Natives* of the Earth, consists only of the *Heads* and *Titles* extracted out of a *Natural History* of these Bodies, composed by Dr. Woodward, and founded wholly upon Experiments and Observations made upon them.

In this Table they are rank'd and distributed according to their *Natural Properties*, and their *Relations* to each other.

Chap. 1. E A R T H S.

The *English*, *Bohemian*, and the *Armenian* Boles. Umbre. Ochre, yellow and red.

Tripela. Terra Militensis.

Chalk. Steinomarga, or Lac Lunæ.

The common black Vegetable Earth.

Loam. Marle. Clay.

Terra Lemnia. Tobacco-pipe Clay.

Argilla, or Potter's Earth. Porcellana.

Steatites, or Soap-Earth. Fuller's-Earth.

Chap. 2. S T O N E S.

SECT. 1. Those that are found in larger Masses.

Lapis Molaris, or Millstone. Grind-stone.

Sand-stone, or Saxum arenarium. Free-stone.

Saxum calcarium, or Lime-stone. Whetstone.

Ragstone.

Lapis fissilis, or Slate.

Hone. Oilstone. Touchstone.

Alabastr. Marble.

Ophites. Porphyrites.

SECT. 2. Stones found in lesser Masses.

Art. 1. Those that do not exceed Marble in Hardness.

§. 1. Those that are of an indeterminate Figure and Texture.

The coarser or gritty Pebbles.

Lapis Violaceo Odore.

§. 2. Those that are of an indeterminate Figure, but of a regular Texture.

Gypsum Striatum, English Talck.

Amianthus sive Asbestos. Alumen plumosum.

Talck.

§. 3. Those that are commonly of determinate Figures.

Selenites. Lapis Spicularis, or Muscovy Glafs.

Ludus Helmontij, or the Waxen Vein.

Lapides Tubulis referti, or the Piped Waxen Vein.

Belemnites, or the Thunder-stone.

The Fossil Coralloid Bodies, simple and branched, and the Stones related to them, e. gr.

Stelechites. Mycetites. Porpites.

Astroites. The Honey-comb-stone.

Fluor or Spar, Stalactites, Stalagmites.
Osteocolla.

Art. 2. *Stones found in lesser Masses, that do exceed Marble in Hardness.*

Those comprehended under this Second Article, are usually called *Gemms* or *Precious Stones*. The whole Tribe of these are exhibited here; and indeed none but them, excepting Pebbles and Flints, which are rank'd of course along with the Agate-kind, to which they really belong.

§. 1. *Those that are Opaque.*

Subdivision 1. *Of one Colour.*

The Turcois. The Nephritick Stone. The Malachite. The two last are sometimes a little variegated.

Subdivision 2. *Of different Colours mix'd in the same Body.*

Lapis Lazuli. Heliotropium, or Blood-stone.
The Jasper.

§. 2. *Semi-pellucid Stones.*

Subdivision 1. *With Colours changeable, according to the different Position of the Stone to the Light.*

Oculus Cati. The Opal.

Subdivision 2. *With Colours permanent.*

The finer Pebbles and Flints, Agates. The Chalcodony.

Mocho-stones. The Oculus Beli. Onyx, and Sardonyx.

The white Cornelion. The red Cornelion, and the Beryl.

§. 3. *Stones Diaphanous, with Colours.*

§§. 1. *Yellow, or partaking of it.*
The Topaz. The Jacinth.

§§. 2. *Red, or partaking of it.*
The Granate. The several Sorts of Rubies.
The Amethyst.

§§. 3. *Blue, or partaking of it.*
The Sapphire. The Water Sapphire.
The Aquemarine.

§§. 4. *Green, or partaking of it.*
The Emerald. The Chrysolite.

§. 5. *Stones Diaphanous, and without Colours.*

Crystal. The Pseudo adamantes.
The white Sapphire. The Diamond.

Chap. 3. S A L T S.

Fossil or Rock Salt. Sal Gemmeum.
The Tincal of Persia. The Natron of Egypt.
Nitre, or Salt Petre.
Alum. Vitriol.

Chap. 4. B I T U M I N A.

§. 1. *Liquid.*

Naptha. Petroleum. Oleum terræ Barbadosis.

§. 2. *Solid.*

Succinum, or Amber. Bitumen. Pissasphaltum.
Gagates, or Jet. Kanal. Coal.

Chap. 5. M E T A L L I C K M I N E R A L S.

Mercury. Cinnabar, the Mineral out of which 'tis drawn. Arsenick.

Sulphur. Pyrites, Marcasita. Cobalt.

Lapis Calaminaris. Antimony.

Bismuth, or Tin-Glass. Speltre, or Zink.

Nigrica fabrilis Merreti, or Black Lead.

Chap. 6. M E T A L S.

Tin. Lead. Silver. Gold.

Copper. The Lapis Armenius is a Copper-Ore.

Iron. The Hematites is an Iron-Ore. There is also a little Iron in the Loadstone. Manganese, Emery, the *Ætes ferruginosa*, the Mineral Bezoar, the Geodes, and the Enhydros.

FOTUS, the same with *Fomentum*.

FOVEA *Cordis*, the same with *Anticardium*.

FOUGATE, or *Fongasi*, is a small Mine dug in form of a Well, in a Place ready to be gained by the Enemy, so that when they have made themselves Masters thereof, it is sprung like a Mine by the Means of a Saucidge.

They are also prepar'd under a Work which is to be blown up, and are charged with Barrels or Sacks of Powder cover'd with Earth.

FOULE, a Word us'd at Sea in two Senses, when a Ship has been long untrimm'd, so that Grabs, Weeds, Barnacles, or Periwinkles, stick or grow to her Sides under Water, she is then said to be foule. They say also a Rope is foule, when it is either tangled in it self, or hindred by another, so that it cannot run or be haled.

FOULE-WATER: A Ship is said to make *foule Water*, when being under Sail, she comes into such Shole or shallow Water, that though her Keel do not touch the Ground, yet she comes so near it, that the Motion of the Water under her raiseth the Mud from the Bottom, and so polluteth or fouleth the Water.

FOUNDER: A Ship is said to founder at Sea, when by any extraordinary Leak, or by a great Sea breaking in upon her, she is so filled with Water, that she cannot be freed of it, nor is she able to swim under it, but sinks with the Weight thereof.

FOURCH, in Law, signifies a Delay, putting off or prolonging of an Action.

FOURTH, a Term in Musick; the same with *Diatessaron*: Which see.

FRACTION, is a broken Number, signifying one or more Parts proportionally of any thing divided. It consists of two Parts, which are two Numbers set one over another, as $\frac{1}{2}$: Of which two Numbers, that below the Line is called the *Denominator*, because it denominates or shews the Nature or Kind of the Parts any Whole is divided into; and the Number above the Line is called the *Numerator*, because it numbers or tells us how many of those Parts the *Fraction* doth consist of. Thus $\frac{1}{2}$ supposes some Whole to be divided into 2 equal Parts, and then that you take 1 of them, or 1 such Parts.

In all *Fractions*, As the *Numerator*: Is to the *Denominator*: :: So is the *Fraction* it self: To that Whole of which it is a *Fraction*. Thus, suppose $\frac{1}{2}$ of

of a Pound be equal to 15 s. then 'tis plain, 3 : 4 :: 15 s : 20 s.

From which general Axiom will follow these Corollaries.

1. That there may be infinite Fractions of the same Value one with another; for there may be infinite Numbers found, which shall have the Proportion one to another as 3 has to 4.

2. When the Numerator is less than the Denominator, the Fraction is less than the Whole, and consequently is what they call a *Proper Fraction*.

3. But when the Numerator is either equal to, or greater than the Denominator, the Fraction is called *Improper*, because 'tis equal to, or greater than the whole. Thus $\frac{4}{3}$ is equal to 1, and $\frac{5}{3}$ is equal to 1 and $\frac{2}{3}$.

Fractions are either *Single* or *Compound*.

Single Fractions are such as have but one Numerator and one Denominator, as $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{6}$.

Compound Fractions, or Fractions of Fractions, are such as consist of more than one Numerator and one Denominator, as $\frac{1}{2}$ of $\frac{3}{4}$ of $\frac{5}{6}$, and are always connected by the Word *Of*.

Reduction of Fractions.

I. To reduce Fractions to their least Terms.

Rule 1. If both Numerators and Denominators are even Numbers, divide each by 2 as long as you can, till an odd Quotient ariseth, and then have recourse to the 4th Rule, which is General.

Thus, this Fraction $\frac{884}{1268}$ will by Bifsection be reduced to $\frac{221}{317}$, and $\frac{2}{4}$ will be reduced to $\frac{1}{2}$.

Rule 2. If both end in Cyphers, cut off an equal Number of them from both, and then proceed by the other Rules.

Thus, $\frac{3450}{4560}$ will become $\frac{345}{456}$.

3. If both Numerator and Denominator end in 5, or one in 5, and the other in 0, they may be always reduced into lesser Terms, by dividing each by 5.

Thus, $\frac{425}{575}$ ($= \frac{17}{23}$), and $\frac{345}{456}$ ($= \frac{345}{456}$).

4. When by none of the former Rules you can reduce them wholly, try this Method, which is General; that is, find the greatest Number that will divide both Numerator and Denominator without any Remainder; and then dividing both Parts of the Fraction by that Number, take the Quotients for a new Fraction, which shall be of the same Value and in its least Terms.

The *Greatest Common Divisor* to any two Numbers is thus found;

Divide the Greater by the Lesser, and then divide the last Divisor by the Remainder, and so continually till nothing remain; and then take the last Divisor for the *Greatest Common Measure* sought.

If after all Trials still there remains Unity, then the Fraction cannot be reduced farther.

Thus, in reducing $\frac{21}{117}$ into its least Terms, 'twill be found to be $\frac{2}{13}$, the *Greatest Common Divisor* being 13,

$$\begin{array}{r} 91 \overline{) 117} \quad (1 \\ \underline{91} \\ 26 \quad (3 \\ \underline{78} \\ 13 \quad (2 \\ \underline{26} \\ 00 \end{array}$$

But this Rule may also be very much abridg'd by this Method, viz. When you find any Remainder to be more than half the last Divisor, subtract it from the Divisor, and divide that Divisor by the new Remainder found by such Subtraction: As suppose you were to find the *Greatest Common Divisor* in this Fraction $\frac{244}{353}$.

$$\begin{array}{r} 744 \overline{) 899} \quad (1 \\ \underline{744} \\ 155 \quad (4 \\ \underline{620} \\ 124 \\ 155 \\ \underline{124} \\ 31 \quad (5 \\ \underline{155} \\ 0 \end{array}$$

Which last Remainder 124 being more than half 155, I subtract it from it, and there remains 31; which dividing 155 without Remainder, I find to be the *Greatest Common Divisor* to those two Numbers.

II. To find the Value of any Fraction in the known Parts of its Integer.

As suppose it was requir'd to know what is $\frac{2}{7}$ of a Pound.

Multiply (9) the Numerator by (20) the Number of known Parts of the next inferior Denomination, and divide the Product by (16) the Denominator of the given Fraction; the Quotient will be 11 s. and the Remainder (4) being multiplied by (12) the Number of known Parts in the next inferior Denomination; and dividing the Product (48) by (16) as before, the Quotient will be 3 d. So that you find that $\frac{2}{7}$ of a Pound is 11 s. and 3 d.

$$\begin{array}{r} 20 \\ \underline{9} \\ 16 \overline{) 180} \quad (11 \text{ s.} \\ \underline{160} \\ 20 \\ \underline{12} \\ 16 \overline{) 48} \quad (3 \text{ d.} \\ \underline{48} \\ 00 \end{array}$$

III. To reduce a mix'd Number (as $4\frac{1}{2}$) into an Improper Fraction of the same Value.

Multiply (4) the Integer Part, by (12) the Denominator of the Fraction; to the Product (48) add the Numerator; the Sum (59) set over the former Denominator (12). Thus $\frac{59}{12}$ will be an Improper Fraction of the same Value with the mix'd Number given; for 12 now divides that Product which before it help'd to produce, and therefore the Value must be the same as before.

IV. To reduce a whole Number into an Improper Fraction.

1. If no Denominator be assign'd, draw a Line under it, and set Unity beneath that Line, and 'tis done. Thus, if 8 were given to be reduc'd, write it in this Manner, $\frac{8}{1}$.

2. But if there be a Denominator (as suppose 3) given, multiply (8) the given Number by (3) the assign'd Denominator, and set the Product over (3) and 'tis done, and stands thus, $\frac{24}{3}$; for the Number 8 is multiplied by 3, and then that Product divided by 3, which makes it of the same Value now as before.

V. To reduce an Improper Fraction into its equivalent mix'd Number, as suppose $\frac{59}{12}$.

Divide (59) the Numerator by (12) the Denominator; the Quotient ($4\frac{1}{2}$) will be the mix'd Number sought.

VI. To reduce a Compound Fraction into a Single one.

Multiply all the Numerators continually for a new Numerator, and all the Denominators for a new Denominator.

Thus, $\frac{1}{2}$ of $\frac{1}{3}$ of $\frac{1}{4}$ reduced, will be $\frac{1}{24}$.

VII. To reduce Fractions of different Denominations to others of the same Value, having the same common Denominator.

1. Reduce them always to their least Terms.

2. Then multiply all the Denominators for a common Denominator; and multiply continually the Numerator of each Fraction into all the Denominators except its own, and that will give new Numerators to be set over the common Denominator.

Thus, if it was requir'd to reduce $\frac{2}{3}$, and $\frac{3}{4}$, and $\frac{5}{6}$ into one common Denominator:

I say, 3 into 7, into 6, produces 126 for a common Denominator.

Then $2 \times 7 \times 6 = 84$, therefore $\frac{2}{3} = \frac{84}{126}$.

And $3 \times 4 \times 6 = 72$, therefore $\frac{3}{4} = \frac{72}{126}$.

Also $5 \times 7 \times 3 = 105$, therefore $\frac{5}{6} = \frac{105}{126}$.

Addition in Vulgar Fractions.

1. If the Fractions proposed have equal Denominators, only add the Numerators, and set the Sum over the common Denominator.

Thus, $\frac{1}{2} + \frac{1}{2} = \frac{2}{2}$.

2. But if they have not a common Denominator, they must be reduced to others of the same Value, that have a common Denominator; then add as in the first Rule.

3. If Compound Fractions are given to be added, they must first be reduced to single ones of the same Value, and then they will fall under these two Rules foregoing.

4. When Fractions of different Denominations are given to be added, they must be reduced into Fractions of the same Denomination, (or which have the same common Integer) by the Rule for reducing Compound Fractions.

Thus, if $\frac{2}{3}$ of a Pound, $\frac{1}{4}$ of a Shilling, and $\frac{1}{2}$ of a Penny, were proposed to be added together, they must all be brought into the Denomination of Pounds.

Thus, $\frac{2}{3}$ of a Shilling is $\frac{2}{3}$ of $\frac{1}{20}$ of a Pound, (which reduced, is $\frac{1}{15}$ of a Pound;) So $\frac{1}{4}$ of a Penny is $\frac{1}{4}$ of $\frac{1}{240}$ of a Pound (which being reduced, is $\frac{1}{960}$) then those two Fractions $\frac{1}{15}$ and $\frac{1}{960}$ may be added by the second Rule.

5. To add mix'd Numbers.

1. Add the Integers in both Numbers together, then add the Fractional Parts, and if their Sum be a proper Fraction, only annex it to the Sum of the Integers.

2. But if it be an Improper Fraction, reduce it to its equivalent mix'd Number; and adding the Integral Part to the first Sum of the Integers, set the remaining Fractional Part after the Integers, and 'tis done.

Thus, $5\frac{1}{2} + 4\frac{1}{2} = 10\frac{1}{2}$.

Subtraction of Vulgar Fractions.

1. If they have a common Denominator, subtract the lesser Numerator from the greater, and set the Remainder over the common Denominator.

Thus, from $\frac{5}{8}$ take $\frac{2}{8}$, and there remains $\frac{3}{8}$.

2. If they have not a common Denominator, they must be reduced to Fractions of the same Value, having a common Denominator; and then as in the 1st Rule.

Thus, $\frac{5}{8} - \frac{1}{4} = \frac{5}{8} - \frac{2}{8} = \frac{3}{8}$.

3. To subtract a whole Number from a mix'd Number, or one mix'd Number from another.

Reduce the whole or mix'd Numbers to Improper Fractions, then proceed as in the 1st or 2d Rule.

N. B. This Rule is General; yet there are particular Rules, which in some Cases are more Expeditious; as follows.

Particular Rules.

1. To subtract a whole Number from a mix'd.

Subtract the whole Number from the Integral Part of the mix'd Number; then to the Remainder annex the Fractional Part of the mix'd Number.

Thus, 3 from $5\frac{1}{2}$, leaves $2\frac{1}{2}$.

2. To subtract a Fraction from 1 or Unity.

Subtract the Numerator from the Denominator, and 'tis done.

Thus, $\frac{1}{2}$ from 1, leaves $\frac{1}{2}$.

3. To subtract a Fraction from any whole Number greater than Unity.

First subtract the Fraction from Unity (by 2d) then from the whole Number given subtract that Unity, and place the remaining Integer before; and the Fractional Part (first found) after it; so shall that mix'd Number be the Remainder sought.

Thus, $\frac{2}{3}$ from 7, leaves $6\frac{1}{3}$.

4. To subtract a mix'd Number from a whole Number.

First subtract the Fractional Part from Unity, borrowed from the whole Number given, and set down the Remainder; then adding the Integer borrowed, to the Integers of the mix'd Number, subtract the said Sum from the whole Number, and to the Remainder annex the Fractional Part first found, and 'tis done.

Thus, $3\frac{1}{2}$ from 9, leaves $5\frac{1}{2}$.

5. To subtract a Fraction from a mix'd Number.

1. If the Fraction given, be less than the Fractional Part of the mix'd Number, only subtract the Fraction from the Fractional Part, and annex the Remainders to the integer Part of the mix'd, and 'tis done.

Thus, $\frac{1}{4}$ from $6\frac{2}{4}$, leaves $6\frac{1}{4}$.

2. But when the Fraction given is greater than the Fractional Part of the mix'd Number;

Subtract the Fraction from Unity, and add the Remainder to the Fractional Part of the mix'd Number; then lessening the Integral Part of the mix'd Number by Unity, annex the Fractional Part (last found) to it:

Thus, $\frac{2}{3}$ from $6\frac{1}{3}$, leaves $5\frac{1}{3}$.

C A S E I.

6. To subtract one mix'd Number from another.

When the Integral Part, and Fractional Part, of the mix'd Number to be subtracted, are both lesser than the Integers and Fractional Parts of the other mix'd Numbers; only subtract the lesser Integer from the greater, and the lesser Fraction from the greater, and to the Remainder of the Integers annex the Remainder of the Fraction, and 'tis done.

Thus, $2\frac{1}{2}$ from $5\frac{2}{2}$ leaves $3\frac{1}{2}$, or $3\frac{1}{2}$.

C A S E II.

When the Fractional Part of the mix'd Number (to be subtracted) is greater than the Fractional Part of the other mix'd Number:

First, Subtract the greater Fraction from Unity, and add the Remainder to the Fractional Part of the other mix'd Number; which Sum, as the Fractional Part of the Remainder sought, is to be kept.

Then add Unity to the lesser Integral Part, and subtract the Sum from the greater Integral Part, and to the Remainders annex the Fractional Part before reserved, and 'tis done.

Thus, $2\frac{2}{3}$ from $7\frac{1}{3}$, rests $4\frac{1}{3}$.

Multiplication of Vulgar Fractions.

1. When the Fractions proposed are both single Fractions, only multiply the Numerators one by

another for a new Numerator, and the Denominators for a new Denominator.

Thus, $\frac{2}{3}$ into $\frac{4}{5}$, produces $\frac{8}{15}$.

2. If one be a mix'd or Whole Number, it must be reduced to an Improper Fraction, and then proceed as in the last Rule.

Thus, $\frac{2}{3}$ into $5\frac{1}{3}$, gives $8\frac{1}{3}$; and $\frac{2}{3}$ into $4\frac{2}{3} = 4\frac{4}{3}$.

N. B. In Multiplication of Fractions the Product is less in Value than either Multiplicand or Multiplier; because in all Multiplications; As Unity: Is to the Multiplier :: So is the Multiplicand: To the Product; or; As Unity: Is to either Factor :: So is the other Factor: To the Product. But Unity is bigger than either Factor (if the Fractions are proper) and therefore either of them must be greater than the Product.

Thus in Whole Numbers; if 5 be multiplied by 8, 'twill be, As 1 : 5 :: 8 : 40; or, 1 : 8 :: 5 : 40. Wherefore in Fractions also, As 1 : $\frac{1}{2}$:: $\frac{1}{4}$: $\frac{1}{8}$; or, As 1 : $\frac{1}{4}$:: $\frac{1}{2}$: $\frac{1}{8}$.

But 1 is greater than either $\frac{1}{2}$ or $\frac{1}{4}$: Wherefore either of them must be bigger than $\frac{1}{8}$.

Division in Fractions.

1. When the Fractions proposed are both single; multiply the Denominator of the Divisor by the Numerator of the Dividend; the Product is the Numerator of the Quote.

Then multiply the Numerator of the Divisor, by the Denominator of the Dividend; the Product is the Denominator of the Quotient.

Thus, $\frac{4}{5}$ \div $\frac{2}{3}$ = $\frac{12}{10}$.

2. If either Dividend, Divisor, or both, be Whole or Mix'd Numbers, reduce them to improper Fractions; and if they be Compound Fractions, reduce them to Simple ones, and proceed as in the first Rule.

N. B. That in Division of Fractions, the Quotient is always greater than the Dividend; because in all Division, As the Divisor: Is to Unity :: So is the Dividend: To the Quotient; as if 3 divide 12, 'twill be, As 3 : 1 :: 12 : 4. Now 3 is greater than 1, wherefore 12 must be bigger than 4: But in Fractions, As $\frac{1}{2}$: 1 :: $\frac{2}{3}$: $\frac{4}{3}$; where $\frac{1}{2}$ is less than 1; wherefore $\frac{4}{3}$ must also be less than $\frac{2}{3}$.

FRACTURA Ossis, the breaking of a Bone, is a Solution of the Continuum in the hard or bony Parts of the Body.

FRÆNULUM, is a membranous Ligament under the Tongue, which being extended too far towards the Tip of the Tongue, hinders Children in sucking, whence they are said to be Tongue-ty'd.

FRÆNUM, is that Ligament whereby the Prepuce is tied to the lower Part of the Glans of the Penis.

FRAISES, in Fortification, are pointed Stakes fixed in Bulwarks made of Earth; on the one side of the Rampart a little below the Parapet. These Stakes being from 7 to 8 Foot long, are driven in almost half way into the Earth, and present their Points somewhat sloping toward the Field. They serve to prevent Scalades and Defection.

FRAME, is the Out-work of a Clock or Watch, consisting of the Plates and Pillars, and which contains in it the Wheels and the rest of the Work.

T. FRANKLIN.

FRANCHISE, in Law, is taken to be a Privilege or Exemption from ordinary Jurisdiction, and sometimes an Immunity from Tribute: It is either Personal or Real; that is, belonging to a Person immediately, or else by means of this or that Place, or Court of Immunity, whereof he is either Chief, or a Member.

FRANCHISE Royal, is where the King granteth to one and his Heirs, that they shall be quit of Toll.

FRANK-ALMOIN, in Law, signifies a Tenure or Title of Lands or Tenements bestow'd upon God; that is, given to such People as bestow themselves to the Service of God, for pure and perpetual Alms.

FRANK-BANK: See *Free-bench*.

FRANK-CHASE, is a Liberty of Free-Chase, whereby all Men (having Ground within that compass) are prohibited to cut down Wood, &c. without the View of the Forester, tho' it be in his own Demefine.

FRANK-FEE, in Law, is that which is in the Hands of the King or Lord of the Mannor, being ancient Demefine of the Crown; whereas that which is in the Hands of the Tenant, is ancient Demefine only.

FRANK-FORM, is a Land or Tenement, wherein the Nature of the Fee is charged by Feoffment out of Knight's-Service for several Yearly Services; and whence neither Homage, Worship, Marriage, nor Relief may be demanded, nor any other Service not contain'd in the Feoffment.

FRANK-FOLD, is where a Lord hath Benefit of Folding his Sheep within his Mannor for the Manuring of his Land.

FRANK-LAW, is taken for the free Enjoyment of all those Privileges which the Law permits to a Man not found guilty of any heinous Offence. And he that loseth his *Frank-Law*, is said to fall into these Inconveniencies:

First, That he may never be impannelled upon any Jury or Assize, or otherwise used in testifying any Truth.

Secondly, If he have any thing to do in the King's Court, he must not approach thither in Person, but appoint his Attorney.

Thirdly, His Lands, and Goods, and Chattels must be seized into the King's Hands; and his Lands must be distrained, his Trees rooted up, and his Body committed to Prison.

FRANK-MARRIAGE, is a Tenure in Land Special, whereby a Man hath Land with a Woman to him and the Heirs of his Body, without doing any Service, but Fealty to the Donor.

FRANK-PLEDGE, in Law, a certain Pledge or Surety for Freeman.

FRANK-TENEMENT: See *Free-hold*.

FREE; the Seamen say, The Pump *free*s the Ship, when it throws out more Water than leaks into her; but on the contrary, when it cannot throw out the Water as fast as it leaks in, they say, The Pump cannot *free* her: Also bailing or lading out Water out of a Boat, is called, *Freeing the Boat*.

FREE-BENCH, *Frank-Bank*, in Law, signifies that Estate in Copy-hold Lands that the Wife, being espoused a Virgin, hath after the Decease of her Husband, for her Dower.

FREEHOLD, or *Frank-Tenement*, is that Land or Tenement which a Man holdeth in Fee, Fee-tail, or at the least for Term of Life; and 'tis either *Freehold in Deed*, or *Freehold in Law*.

Freehold in Deed, is the Real Possession of Lands or Tenements in Fee, Fee-tail, or for Life.

Freehold in Law, is the Right that a Man hath to such Lands or Tenements before his Entry or Seifure.

FREESE, a Term in Architecture: See *Frize*.

FREESEING: The *Cartesians* explicate Freezing by the Refecs, or going out of the Etherial Matter from the Pores of the Water or other Liquor; which being once done, the finer Parts are too small and flexible to keep the long, slender, and Eel-like Particles of Water fluent, or in the form of a Liquor.

But the *Corpuscularians* ascribe the freezing of Water more probably, to the Ingrefs of Multitudes of cold or frigorifick Particles, as they call them, which entering the Liquor in Swarms, and dispersing themselves every way thro' it, do crowd into the Pores of the Water, and hinder the wonted agitation of its Parts, and wedge it up as it were into the hard or consistent Body of Ice.

Freezing Mixture, is what is mix'd together in order to freeze other Bodies. Mr. Boyle in his History of Cold shews, That not only all Sorts of Salts, whether *Alkalizats* or *Acid*, but even *Ardent Spirits*, such as that of Wine; also Sugar and *Saccharum Saturni*, mix'd with Snow, are capable of freezing other Bodies; and the same Effect was also very eminently produced by the Mixture of Oil of *Vitriol*, or Spirit of *Nitre* with Snow, &c.

That Ice is specifically lighter than the Water out of which it is by freezing made, is certain by its swimming in it; and that this Levity of Ice proceeds from these numerous Bubbles, which are produced in it by its Congelation, is equally plain; but how those Bubbles come to be generated in freezing, and what Substance they contain in them (if they are not quite empty) is an Enquiry of great Importance, and perhaps if discovered, may help us much to understand the Nature of Cold.

Mr. *Hobbs* asserts, That they are occasioned by the common Air, which intrudes into Water in its Coagulation, and so expands it.

But First, No such Ingrefs of Air into Water appears in its Coagulation; and that it doth not get into frozen Oil is plain, because that Body is condensed by being frozen.

Secondly, Mr. Boyle shews by undoubted Experiments, That Water frozen in Glasses sealed hermetically, and in Bras Bodies or Vessels closely stoppt, hath yet been turn'd into Ice abounding with these Bubbles.

Thirdly, He proves also by Experiment, That Water kept a while in the exhausted Receiver, till all its Bubbles were emerged and gone, being afterwards turn'd into Ice by a freezing Mixture, that Ice had scarce any Bubbles at all in it. Whence 'tis plain these Bubbles are filled with some Matter which is within the Water, if they are filled with any thing: But he proves also by plain Experiments, that they have none, or at least exceeding little true Elastick Air contain'd in them. See Vol. II.

FREEZLAND-HORSE, the same with *Chevauze de Freeze*.

FRESCO, in Architecture, to *Paint in Fresco*, is a sort of Painting which is made upon the Plastering of an Edifice before it be dry.

FRESH-DISEISEIN, in Law, signifies such a *Disseisin*, as a Man may seek to defeat of himself, and by his own Power, without the help of the King or Judges.

FRESH-FINE, is that which is levied within a Year past.

FRESH-FORCE, is a Force done within forty Days: For if a Man be disseised of any Lands or Tenements within any City or Boroughs, or *desorced* from them after the Death of his Ancestor, to whom he is Heir, or after the Death of his Tenant for Life, or in Tail, he may within forty Days after

this

his Title accrued, have a Bill out of the Chancery to the Mayor, &c.

FRESH-SHOT, in the Sea Phrase, signifies the falling down of any great River into the Sea, so that the Sea has fresh Water a good Way from the Mouth of that River, which sometimes by Accident is by the Descent of Land-Waters on a sudden; and as this is more or less, they call it a great or small *Fresh-Shot*.

FRESH-SUIT, in common-Law, is such a present and earnest Pursuit of an Offender, as never ceaseth from the Time of the Offence committed or discovered, until he be apprehended: And the Effect of this in the Pursuit of a Felon is, that the Party pursuing shall have his Goods again; whereas otherwise they are the King's.

FRETT, a Bearing in Heraldry of this Figure.



Diamond, a *Frett Topaz*: The Coat Armour formerly of *Henry Lord Maltrevers*, and now quartered by the Duke of *Norfolk*.

Here is but one *Frett*, but sometimes the *Frett* is of eight Pieces, and then 'tis specified to be so; but if it consist of more, 'tis called *Frette*.

FRIABLE, a Word used in reference to such Bodies as will easily on rubbing break, crumble, or divide into small Parts.

FRIGID Zones, See *Zones*.

FRIGORIFICK Particles, are small Particles of Matter, actually and essentially Cold, which entering and penetrating other Bodies, do (according to the Opinion of *Gassendus* and others) produce in them that Quality which we call Cold: See *Cold*.

FRISE, or *Fresse*, in Architecture, is that round Part of the Entablature which is between the *Architrave* and *Cornice*. This the *French* call the *Gorgé-rin* or *Collier*.

FRODMORTEL, or rather *Freemortoll*, in Law, is an Immunity or Freedom granted for Murder or Man-slaughter. *Cowel*.

FROENULUM, or *Frænum Penis*, is a Membrane which ties the *Præputium* to the Glands of the *Penis*.

FRONT, in Perspective, is the Orthographical Projection of an Object upon a Parallel Plane.

FRONT, in Fortification, is what the *French* call *Tenaille de Place*, and the Face of a Place. It is that which is comprehended between the Points of any two neighbouring Bastions, *viz.* the Courtine, the two Flanks which are raised upon the Courtine, and the two Faces of the Bastions which look towards one another.

FRONT-LINE, in Perspective: See *Line of the Front*.

FRONTALE, or *Frontlet*, is an external Medicine, frequently applied to the Forehead for a Pain or Heat in the Head: It is made for the most Part of Herbs, Flowers, Seeds, Meal moistned with Vinegar of *Roses*. *Blanchard*.

FRONTALIS, is a Muscle which arises thin, broad, and fleshy from the upper Part of the *Os Frontis*, near the *Sutura Coronalis*, and descending by the Posterior and Forepart of the *Temporals*, meets with its Partner near their Insertions to the Skin of the Eye-brows; these draw up and wrinkle the Skin of the Forehead.

FRONTATUM, is a Term used by Mr. *Ray*, and other Botanists, to express that the Leaf of a Flower (*Petalum*) grows broader and broader, and at last perhaps is terminated by a Right Line; and 'tis used in opposition to *Cuspidatum*, which expresses that the Leaves of a Flower end in a Point.

Thus *Marygold*; *Petala habent Frontata*,
But *Flos Solis*, *cuspidata*.

FRONTIS Os, or *Coronale*, is a Bone of the *Cranium*, in form almost round; it joins the Bones of the *Sinciput* and Temples, by the Coronal Suture, and the Bones of the upper Jaw by the *Sutura Transversalis*, and the *Os Sphenoides* by the *Sutura Sphenoidalis*. It forms the upper Part of the Orbit, and it has four *Apophyses*, which are at the four Angles of the two Orbits. It has two Holes above the Orbits, through which pass the Veins, Artery, and some Twigs of the first Branch of the fifth pair of Nerves. It has also one in each Orbit, a little above the *Os Platum*, through which a Twig of the Ophthalmick Branch of the fifth pair of Nerves passes to the Nose, it is the Orbiter *Internus*. It has two *Sinus*'s above the Eye-brows, between its two Tables; they are lined with a thin Membrane, in which there are several Blood-Vessels and Glands, which separate a Mucous Serosity, which falls into the Nostrils. The Inside of this Bone has several Inequalities, made by the Vessels of the *Dura Mater*. It has two large Dimples, made by the anterior Lobes of the Brain. Above the *Crista Galli* it has a small blind Hole, into which the End of the *Sinus Longitudinalis* is inserted. From this Hole it has a pretty large Spine which runs up along its Middle; instead of this Spine there is sometimes a *Sinus*, in which lies the *Sinus Longitudinalis*, which ought to be observed carefully by Surgeons in Wounds of this Place. This Bone is thicker than the *Sinciput* Bones, but thinner than the *Os Occipitis*: In Children it is always divided into its Middle by a true Suture.

FRONTON, is a Part or Member in Architecture, which serves to compose an Ornament raised over Doors, Cross-works, Niches, &c. sometimes making a Triangle, and sometimes Part of a Circle. It is also called *Faggium* by *Vitruvius*, and *Pediment* by the *French*.

FROZEN Zones: See *Zones*.

FRUCTIFEROUS, is that which produces Fruit; and is a Word used by my Lord *Bacon* and others, for such Experiments in Natural Philosophy, which are advantageous to the Experimenter in Point of Gain or Profit.

FRUMENTA and *Fru mentaceous Plants*, are by the Botanists reckon'd all such as have their Culm (or Stalk) pointed, and their Leaves like Reeds; and which bear their Seed (which is fit to make Bread, or be ground into Flower) in *Ears*, like common Corn; for they reckon two Kinds of *Fruges*, *Frumenta* and *Legumina*: See *Gramineous* and *Culmiferous Herbs*.

FRUSTUM, in Mathematicks, signifies a Piece cut off, or separated from any Body; as the *Frustum* of a Pyramid or Cone, is a Part or Piece thereof cut off (usually) by a Plane parallel to the Base.

All Round and Square Timber that is tapering may be conceiv'd as the *Frustum* of a Cone or a *Pyramid*. To find which, take the following Theorem, which in the main is Mr. *Oughtred*'s, who at *Pag. 99.* of his admirable *Clavis*, gives this and two others for the same Purpose.

Given

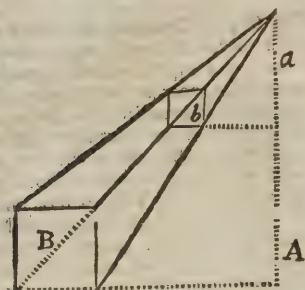
B, the Side of the greater Base,
b, the lesser Base's Side,
A, the Height of the *Frustum*,

Tho' below I suppose B and b to represent the Areas of the two Bases.

T t 2

Whole

Whole Height $a + A = H$.



First, To find a , say, As $B - b :: A : \frac{bA}{B-b}$
 or $\frac{bA}{x}$. Now $BH = 3$ times the whole Pyramid,
 because any Prism is 3 times a Pyramid of the same
 Base and Height with it, by 7. *Euclid*, and
 $bA = 3$ times the upper Pyramid. Wherefore
 $\frac{bA}{B-b}$ equal to the *Frustum* of the Pyramid
 required; Which Theorem in Words is this:

Multiply the lower Base by the whole Height, and
 from the Product subtract the upper Base multi-
 ply'd by the Height of the Top-piece wanting;
 and then one third of the Remainder shall give the
 Frustum.

And the same way you may proceed for the *Fru-*
stum of a Cone; only 'twill be more difficult to
 find the Circular Bases.

FUGA Vacui; it is a Notion of the Peripateticks,
 and some other Ancient Philosophers, that there is
 an *Abhorrence in Nature of a Vacuum*; and this in
 Latin they call *Fuga Vacui*, or Nature's endeavour
 to avoid a *Vacuum*.

FUGILE, an Imposthume in the Ears. *Blan-*
chard.

FUGITIVES Goods, are the proper Goods of him
 that flieth upon Felony, which after the Flight law-
 fully found, do belong to the King or Lord of the
 Mannor.

FUGUE, in Musick, is some Point consisting of
 4, 5, 6, or any other Number of Notes begun by
 some one single Part, and then seconded by a third,
 fourth, fifth and sixth Part (if the Composition con-
 sists of so many) repeating the same or such like
 Notes, so that the several Parts follow, or come in
 one after another in the same manner, the leading
 Parts still flying before those that follow.

FUGUE-DOUBLE, is when two or more differ-
 ent Points move together in a *Fugue*, and are al-
 ternately interchanged by several Parts.

FULIGINOUS Vapours, according to some, are
 thick, impure, and sooty Vapours.

FULMINATING Powder: See *Aurum Fulmi-*
nans, and *Pulvis Fulminans*.

FULMINATION, the same with *Detonation*;
 which see.

FUMIGATIO Chymica, is an Erosion of Metal
 by Smoak or Vapour.

FUMIGATION, is making one Body receive the
 Smoak of another, in order to impregnate it with
 the more Volatile Parts of the Body burnt.

FUNCTION, the same that *Action*. is, in re-

ference to any Operation of the Organical Parts of
 an Animal Body, an effective Motion produced in
 the Part by the proper Aptitude, or Fitness of such
 Part for the Uses the Author of Nature designed it.

FUNDUS Plantæ, the Botanists call that the Bot-
 tom of a Plant, where the Stalk and Root just meet
 and join.

FUNGUS, is a soft spongy Flesh which grows up
 on Wounds.

FUNICULAR Hypothesis, was advanced by
Franciscus Linus, against the Notion of the Spring
 and Weight of the Air; and he supposes, That the
 Suspension of the Mercury in the Torricellian Experi-
 ment, is not caused by the Weight of the Atmo-
 sphere pressing on the Mercury in the Basin, but by
 a kind of *Funiculus* of some very fine and thin Sub-
 stance; which being exceedingly rarified by a forcible
 Distension, is continually contracting it self up,
 or becoming more distended according to the differ-
 ent Temperament of the external Air, and by this
 Means occasions the rising and falling of the Quick-
 silver in the Barometer.

But 'tis strange that this little Rope or String at
 the Top would be able to sustain all the Mercury re-
 quisite to form a Column of 30 Inches in length;
 and that as Part will run out of the Tube when there
 is more Mercury in it, so none at all should run out
 after it is come to its due length: Since Mercury is a
 Fluid Body, how comes the *Funiculus* to turn it into
 a solid one? And by its little Strings hold it so to-
 gether, that none can run out?

FUNICULUS, Intestinum, Laqueus, or Ductus
Umbilicalis, the Navel-string, is a Membranous
 Channel or Conduit in the *Fetus*, which reaches
 from the Navel to the *Placenta* in the Womb; it
 contains two Arteries, one Vein, and the Urinary
 Passage in the *Fetus*, saith *Blanchard*. Indeed the
Umbilical Vessels between the Navel and the *Pla-*
centa are wrapt up in a Production of the *Chorion*
 and the *Amnion*, which is generally about a Foot and
 an half long, that the Motion of the *Fetus* may not
 pull the *Placenta* from the Womb: The Use of this
 Navel-string is to carry the Mother's Blood by the
 Veins to the *Fetus*, for its Nourishment; and that
 which is unfit for this Purpose, is carried back by the
 Arteries to the *Placenta*, while the *Fetus* is still sup-
 plied with more from the Vein; so that there is a
 continual Circulation of Blood between the Mother
 and the *Fetus*.

FURCALE Os, the same with *Furcula*.

FURCELLA, the same with *Furcula*.

FURCHE, so the Heralds call
 the Form of this kind of *Crofs* in a
 Coat of Arms.



FURCULA Superior, is the upper Bone of the
Sternum or Breast-bone; others call it *Fugulum*.
Blanchard.

FURFURATION, or *Furfures*, is when Dan-
 drifts fall from the Head in Combings; it comes for
 the most part from that Skin which is under the
 Hair; also from the Beard and Eye-brows. *Blan-*
chard.

FURFURES, the Scales that fall from the Head,
 and sometimes from Skin of the other Parts of the
 Body, occasion'd by the Separation of the *Cuticula*
 or Scarf-skin from the *Cutis*, or true Skin. *Blan-*
chard.

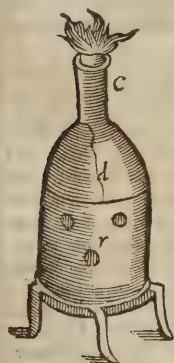
FURLE,

FURLE, the Sea Word for wrapping up and binding any Sail close to the Yard, which is done first by haling up the Braces, and then wrapping the Sail close together, and so binding it fast to the Yard with the Caskets, and Furling-lines. This was formerly written *Farthel*, because the Sail is thus made up in a Bundle or Farthel; but 'tis now every where corrupted into the Word *Furle*.

FURLING-LINES, are small Lines made fast to the Top-sails, Top-gallant-sails, and to the Misen-yard-Arms, to furl up those Sails. Indeed the Misen hath but one Furling-Line, but all the rest have two, one at each end.

FURNACE, the Chymists have several sorts of Furnaces, as the *Reverberatory*; which see under that Word: A *Wind Furnace*, or *Furnace for Fusions*, which is so called, because the Wind comes forcibly to blow the Coals, in order to *Melt* or *Fuse* the Matter in the *Crucible* or *Coppel*. This Furnace for *Fusions*, is in form just like the *Reverberatory*, only less, and there is no need of laying the two Cross Bars there mention'd. They frequently also use *Moveable Furnaces*, whose make is like that of the *Reverberatory*, and they are made of a Paste consisting of three parts of Powders of broken Pots, and two parts of Clay well temper'd together with Water.

Lemery gives the following Figure of a small moveable Furnace for *Fusions*.



c The Chimney.

d The Dome, consisting of two pieces.

r Three Registers, or Holes, to let in the Air to come to the Fire.

FURNITURE of a Dial, are such Lines as are drawn thereon for Ornament; as the *Parallels of Declination*, *Length of the Day*, *Azimuths*, *Points of the Compass*, *Babylonish* and *Jewish Hours*, &c.

FURRING of a Ship, is laying on double Planks on her Sides; this is done after the Ship is built, and is by the Sailors called *Plank upon Plank*: But there is another way of *Furring* which is more properly so called; and that is, when a Ship's Planks are ripped, and new Timbers are put on the former Timbers, and on them other Planks; which is done sometimes to make a Ship bear her Sails the better.

FURRS, in Heraldry, are used in the Doublings of the Mantles pertaining to a Coat of Arms, and sometimes to the Coat it self: They are usually of two Colours; as *Ermins* and *Ermines*, which are black and white; *Erminois* and *Peau*, which are black and yellow; *Vair*, which is white and blue; *Verry*, which is yellow and red, or the like colours.

FURUNCULUS, a Boil, is an acute Swelling as big as a Pigeon's Egg, attended with an Inflammation and Pain, especially when it begins to corrupt and putrify; when it is open'd, and the Matter let out, part of the Flesh underneath is turned into a Corruption of a whitish and reddish colour, which some

call the Ventricle of the *Furunculus*; there is no danger in it, tho' you apply no Remedy to it; for it ripens of it self, and bursts; but the Pain makes it more eligible to apply a Remedy, because that frees the Patient sooner from his Trouble. *Blanchard*.

FUSAROLE, is a small round Member in Architecture, cut in form of a Collar, with somewhat long Beads under the *Echinus*, or Quarter Round of Pillars of the *Dorick*, *Ionick*, and *Composite Orders*.

FUSE or *Fusel* of a Bomb, or Granado-shell, is that which makes the whole Powder, or Composition in the Shell take Fire, to do the designed Execution; 'tis usually a Wooden Pipe or Tap filled with Wild-fire, or some such Composition, and is design'd to burn so long, and no longer, as is the Time of the Motion of the Bomb from the Mouth of the Mortar to the Place where it is to fall; which Time Mr. *Anderson* makes to be about 27 Seconds; so that the Fuse must be contrived either from the Nature of the Wild-fire, or the length of the Pipe which contains it, to burn just that Time.

FUSIL, in Heraldry is a Rhomboidal Figure; more slender than a Lozenge. Thus,



And sometimes thus;



The latter of which seems to be the true Figure, for the Fusil was anciently a kind of Spindle used in Spinning.

The Word *Fusil* also signifies a Fire-lock; whence comes our Word *Fusileers*, i. e. Soldiers carrying only Fire-Arms, and without Pikes.

FUSILIERS, are (in an Army) the same with Musqueteers, and are so called from the Word *Fusil*, which signifies sometimes a Musket.

FUSILLY, in Blazon, is when the Field of an Escutcheon is divided throughout into *Fusils*, as thus:

He beareth *Fusil Sable* and *Ermin*.



The like is to be understood of *Lozenge*, or *Fretty*, respect being had to the Figure.

FUSION, in Chymistry, is the same as *Melting*; so that their Furnace for melting of Metals is called the Furnace for *Fusions*. The Cause of *Fusion*, or the Reason of melting Metals, &c. is this, That by the Force of the Heat or Fire, the Cohesion of the Parts is dissolved, and the Metalline Particles being disjoined, and having a Figure proper to slide over one another's Surfaces, are moved with a most rapid Motion, and so put on the Form or Appearance of a Fluid.

FUSY, is that Part of a Watch about which the Chain or String is wrapped, and is that which the Spring draweth, being in Form commonly taper. In larger Works going with Weights it is *Cylindrical*, and is called the Barrel.

To find what Number of Turns the *Fusy* will have, use this Proportion:

As the Beats of the Balance in one Turn of the Great-Wheel or *Fusy*, (suppose 26928) : Is to the Beats of the Balance in one Hour (20196) :: So the Continuance of the Watches going in Hours

(suppose 16) : To the Number of the Turns of the *Fusy* (12).

That is, 26928 : 20196 :: 16 : 12.

FUTTOCKS, are the Compassing Timbers in a Ship; which make her Breadth; those below next the Keel are called her *Ground Futtocks*; the other the *Upper Futtocks*.

GAL

GABEL, according to some of our Ancient Records, Statutes, Charters, &c. signifies a Rent, Custom, or Duty yielded or done to the King, or any other Lord, not by Contract or Bargain, but imposed by the Will of the Lord. Both the Word and Thing it self is grown quite out of Fashion in *England*, where no Duty can be imposed upon the Subject but by Act of Parliament; but in *France* it is still practised, where it signifies an Excise upon Salt, and is a very heavy one.

GABIONS, a Term in Fortification, signifying Baskets made of Osier-Twigs, equally wide at the Top and Bottom, about four Foot in Diameter, and from five to six high; which being filled with Earth, are sometimes used as Merlons for the Batteries, and sometimes as a Parapet for the Lines of Approach, when it is requisite to carry on the Attacks through a Stony or Rocky Ground, and to advance them with extraordinary Vigour. They serve also to make Lodgments in some Posts, and to secure other Places from the Shot of the Enemies, who nevertheless endeavour to set the Gabions on Fire with Pitch'd Faggots, to render them useless.

GAGE, when one Ship is to Windward of another, she is said to have the *Weather-gage* of her: The Seamen call also trying how much Water a Ship draws, *Gaging*, or rather *Gauging* of her; and it is thus done; They drive a Nail into a Pike near the End, and then put down this Pike by the Rudder till the Nail ketch hold under it, for then as many Feet as the Pike is under Water, is the *Ship's Gage*, or the Depth of Water she draws.

GAGE, in Common Law, signifies a Pawn or Surety: See more in *Wage*.

GAGE-POINT: See *Gauge-Point*.

GALAXY, or *Via Lactea*: See *Milky-Way*.

GALE, the Sea Word for the blowing of the Wind at Sea: When the Wind blows not so hard but that a Ship can carry her Top-sails a Trip, (that is, hoisted up to the highest) then they say it is a *Loom Gale*; when it blows very strong, they say it is a *stiff*, or *strong*, or at least, a *fresh Gale*; but when it blows so hard and violently that a Ship cannot bear any Sail, they say it blows a *Storm*. When two Ships are near one another at Sea, and there being but little Wind blowing, one of them finds more of it than the other, they say that the Ship *Gales* away from the other.

GALEA, is a Pain in the whole Head, so called from the Likeness of the Place, because it takes in, or encompasses the whole Head like an Helmet; in Latin *Galea*. *Blanchard*.

GALEA is likewise used when the Head of the *Fetus* is clothed with Part of the Membrane called *Amnion*, as it comes into the World; they say then it hath a *Galea*. *Blanchard*.

GAN

GALENICK-MEDICINE, is that Physick which is built upon the Principles of *Galen*, and therefore they are *Galenists* who embrace the Foundations of that Art, which are fetched from *Galen* and his Principles; though 'tis now frequently opposed to the Chymical Method of Practice, which, they say, is much shorter. *Blanchard*.

GALL: See *Bile*.

GALL-BLADDER, the same with *Folliculus Fellis*.

GALLACTOPHORI, are *Ductus*'s which carry Milk, and convey the Chyle (as some Modern Authors have fancied) a strait way from the Guts to the Glandules of the Breasts; yet the Arteries are more properly so called, because they carry the Chyle along with the Blood to the Breasts, wherein the Milk is separated and reserved for the Use of the *Fetus*.

GALLERY, in a Ship, is that Beautiful Frame which is made upon the Stern without-board, into which there is a Passage out of the Captain's Cabin, which is called the Great Cabin; and these Galleries are indeed rather for Stately Shew, and the Captain's Pleasure, than any other Benefit; for in Ships of War all open Galleries of this kind are to be avoided, in regard of the Facility of an Enemy's Entrance, and boarding of the Ship that way.

GALLERY, in Fortification, is a covered Walk, the Sides whereof are Musket-proof, consisting of a Double Row of Planks lined with Plates of Iron; the Top being sometimes covered with Earth or Turf, to hinder the Effect of the Artificial Fire of the Besieged. These Galleries are frequently made use of in the Moat already filled with Faggots and Bivins, to the end that the Miner may approach safe to the Face of the Bastion, when the Artillery of the opposite Flank is dismounted.

GALREDA, a thick viscous Juice that is extracted by boiling from the Gristly Parts of Animals, and is usually called a *Gelly*.

GANG: To Man the Boat, in the Sea Phrase, is to put a Gang of Men (which is a Company) into her: They are commonly called the *Coxswain's Gang* who hath the Charge of her.

GANGWAY, signifies all the several Entrances, Ways, or Passages from one Part of the Ship to the other; and whatsoever is put in any one of these Passages, are said to be laid or put in the *Gangway*.

GANGLION, is an Humour in the Tendinous and Nervous Parts, proceeding from a Fall, Stroke, or otherwise: It resists if stirred; if pressed upon the Side, is not diverted, nor can be turned round. *Blanchard*.

GANGRENE, is a Cadaverous Corruption of a Part, attended with a beginning of Stink, Blackness, and Mortification. *Blanchard*.

GARB,

GARB, the Term in Heraldry for a Wheat-Sheaf.
GARBOARD-PLANK, the first Plank of a Ship fastened on her Keel; as

GARBOARD-STRAKE, is the first Seam in a Ship next to the Keel.

GARD DU-CORD, or *Gard-du-Gut*: See *Gard-decut*.

GARDECAUT, or *Gard-du-cord*, is that which stops the Fusy of a Watch when wound up, and for that end is driven up by the String; some call it *Guard-Cock*, others *Gard-du-Gut*.

GARDEYNE DEL EGLISE, or *Church-Warden*, are Officers chosen in every Parish to have the Care and Custody of the Church Goods; and they may have an Action for the Goods of the Church, and divers other things they may do for the Benefit of the Church: They are to join with the Overseers for the making of Rates, and other Provision for the Poor of the Parish.

GARDIAN, or *Guardian*, signifies generally him that hath the Custody or Charge of any Person or thing; but most commonly him that hath the Education or Protection of such People as are not of sufficient Discretion to guide themselves and their Affairs, being indeed as largely extended as *Tutor* and *Curator* among the *Civilians*; for whereas *Tutor* is he that hath the Government of a Youth until he come to fourteen Years of Age; and *Curator*, he that hath the imposition and ordering his Estate afterwards, until he attain to the Age of five and twenty Years; or that hath the Charge of a Frantick Person during his Lunacy; both these with us are called *Guardians*.

A *Tutor* is either *Testamentarius*, or à *Prætoribus ex Lege Atilia*; or lastly, *Legitimus*: So we have three sorts of *Guardians* in England, one ordained by the Father in his last Will, another appointed by the Judge, the third cast upon the Minor by the Law and Custom of the Land.

As to the first of these, a Man having Goods or Chattels, may appoint a *Guardian* to the Body or Person of his Child, by his Last Will and Testament, until he come to the Age of fourteen Years, and to the disposing and ordering of his Estate so long as he thinks meet, which is commonly to one and twenty Years of Age. The same he may do of Lands not holden in *Capite*, or by Knight's-Service; but the ancient Law in this Case is very much altered, and in all Cases gives the Father Power to appoint a *Guardian* for his Child; but if the Father order no *Guardian* to his Child, the Ordinary may appoint one to manage his Goods and Chattels till the Age of fourteen Years; at which time he may chuse him another *Guardian*, as by the Civil Law he may his *Curator*; for this Rule holds, that is, *Invito Curator non datur*. And for his Lands the next a-kin on that Side, by which the Land cometh not, shall be *Guardian*, who was formerly called *Guardian in Socage*.

GARDIAN, or *Guardian of the Spiritualities*, is he to whom the *Spiritual Jurisdiction* of any Diocese is committed during the Vacancy of the See. And the *Guardians* of the *Spiritualities* may either be *Guardian* in Law, or *Jure Magistratus*, as the Archbishop of any Diocese within his Province; or *Guardians* by Delegation, as he to whom the Archbishop or Vicar-General doth for the time depute.

GARDIAN, or rather *Warden of the Cinque Ports*, is a principal Magistrate that hath the Jurisdiction of those Havens in the South-East part of England, which are commonly called, *The Cinque Ports*; that is, the five *Ports* or *Havens*; who there hath all

that Jurisdiction that the Lord High Admiral of England hath in Places not exempt.

GARGAREON, the same with the *Epiglottis*, or Cover of the Wind-pipe; which see.

GARGARISM, is a Liquid Medicine which is used to cleanse the Mouth and the adjacent Parts, by gargling or moving it up and down in the Throat without swallowing; and it is either a Decoction, wherein convenient Syrups are dissolved, or distilled Waters mixed with Syrups, and sometimes with Mineral Spirits. *Blanchard*.

GARLAND, in a Ship, is that Collar of Rope which is wound about the Head of the Main-mast, to keep the Shrouds from galling.

GARNET, is a Tackle in a Ship, having a Pendant coming from the Head of the Main-mast, with a Block strongly seized to the Main-stay just over the Hatch-way; in which Block is reeved the Runner, which hath an Hook at one End, in which is hitched the Slings; and at the other End is a Double Block, in which the Fall of the Runner is reeved, that so by it any Goods or Casks that are not over-heavy, may be haled and hoisted into, or out of the Ship; when this *Garnet* is not used, it's fastened along by the Stay at the Bottom of it.

GARNISHEE, is taken for the Party in whose Hands Money is attached within the Liberties of the City of London, so used in the Sheriff of London's Court, because he has had *Garnishment* or Warning, not to pay the Money, but to appear and answer to the Plaintiff's Creditor's Suit.

GARNISHMENT, in Law, is a Warning given to one for his Appearance, for the better furnishing of the Cause and Court; as if one is sued for the Detinue of certain Evidences and Charters, and saith, That the Evidences were delivered to him, not only by the Plaintiff, but another also; therefore prayeth that that other may be warned to plead with the Plaintiff, Whether the said Conditions be performed or no? And in this Petition he is said to pray *Garnishment*: *New Book of Entries*, Fol. 211. Col. 3.

GARRISON, is a certain number of Officers and Soldiers that defend a Place.

GARTER, a Term in Heraldry, signifying the Moiety or half of a *Bend*: See *Bend*.

GAS, a Word used by *Van Helmont*, and seems designed to signify in general a Spirit not capable of being coagulated: But he uses it loosely in many Senses; as he calls the Vital Principle in Man, *Gas Vitale*; that Sulphureous or Arsenical, or any other way noxious Damp which is found in some Mines, he calls *Gas Pingue Sulphureum*: Nay, sometimes he calls the Air its *Gas Ventosum*, as he doth Water *Gas Salium*; and in short, speaks very unintelligibly and inconsistently about it, as the Chymist's Manner is in other things.

GASTEROCNEMIUM, is the Calf of the Leg, whence its Muscles are called *Gasterocnemii*, from their swelling like a Belly: Therefore two of these Muscles are called *Gasterocnemii*.

GASTEROCNEMIUS *Externus*, also *Gemellus*, is a Muscle of the *Tarsus*, so called, (because with the *Soleus* or *Internus* of that Name) it composes the Calf of the Leg: It is also called *Gemellus*, from its being as it were double. It has two distinct Fleishy Originations, from the superior and hindmost Parts of each Tubercle of the lower Appendage of the Thigh Bone, which in their Descent are each dilated into two large Fleishy Bellies, the innermost of which is thickest and largest, having each a differing Series of Fleishy Fibres, and join to each other near where they make a broad strong Tendon,

tion, which narrowing it self, joins with the great Tendon of the *Gastrocnemius Internus*, four Fingers breadth above its Insertion to the *Os Calcis*. When this Muscle acts, the Foot is said to be extended or pulled backwards, which Motion of it is very necessary in Walking, Running, Leaping, and Standing on Tiptoe, &c. Hence it is, those that walk much, that carry heavy Burthens, Chairs, &c. and who wear low-heel'd Shoes, have these Muscles larger than others.

GASTROCNEMIUS Internus, is a Muscle of the Foot, which is placed under the *Gastrocnemius Externus* and *Plantaris*. It is also called *Soleus* from its Figure, resembling a Sole-Fish. It's externally fleshy Part is covered with a Transparent Tendinous Expansion, which makes it appear of a livid Colour. Its Beginning is partly Tendinous, but chiefly Fleshy from the hindermost Part of the upper Appendix of the *Fibula*, and Back-part of the *Tibia*, that is below the Insertion of the *Subpopliteus*, and increasing to a large Fleshy Belly composed of various Orders of Fleshy Fibres, some of them underneath aptly expressing the Figure of the Top of a Feather, whose *Stamina* here being Tendinous, join with the great Tendon, which is about a Finger's Breadth in Length, and inserted to the superior and hindmost Part of the *Os Calcis*. The Foot, together with the Toes, being as it were a Lever to the whole Body, ought therefore to be attended with Muscles of great Strength to extend it; wherefore we find these Muscles so much to exceed the *Antagonist*, the *Tibialis Anticus*, as well in the advantageous Construction of their differing Series of Fleshy Fibres, as their Magnitude and Insertion at the Extremity of the *Os Calcis*, whereby they are not only rendred serviceable in Walking, Running, Leaping, &c. but do also support the *Tibia* in Standing, lest the superincumbent Pressure of the Weight of the Body should make them incline forwards at their Articulations with the *Talus*.

GASTROEPIPIOICA, is the Vein and Artery which goes to the Ventricle and Cawl.

GASTRORHAPHIA, is a Connexion or a Suture in the Wounds of the Abdomen.

GASTROTOMY, the cutting of the Abdomen: See *Cæsarean Section*.

GATE of the Sea, or a *Sea-Gate*, is when two Ships lie aboard one another in a Wave or Billow, and by that Means sometimes become Rib-broken.

GAVEL, in Law, signifies Tribute, Toll, Custom, Yearly Rent, Payment, or Revenue, of which there are several Kinds, as *Gavel-Corn*, *Gavel-Malt*, *Out-Gavel*, *Gavel-Fodder*, &c.

GAVELET, is a special and ancient kind of *Cessavit* used in *Kent*, where the Custom of *Gavel-kind* continueth, whereby the Tenant shall forfeit his Lands and Tenements to the Lord of whom he holdeth, if he withdraw from him his due Rents and Services. Mr. S. in his *History of Gavel-kind* says, That this *Gavelet* was not a Rent or Service, but signified a Rent or Service withheld, denied, or detained, causing the Forfeiture of the Tenement to the Lord; with which the Lord Coke agrees, where he says, That *Gaveletum* is as much as to say, to cease, or to let to pay the Rent. And it seems this Writ lay in *London* as well as *Kent*.

GAVEL-KIND, signifies, in Law, a Custom, whereby the Land of the Father is equally divided at his Death among all his Sons, or the Land of the Brother at his Death equally divided among all his Brethren, if he have no Issue of his own. This Custom is still in force in divers Places of *England*, e-

specially in *Kent*, *Urchensfield* in *Herefordshire*, and elsewhere, though with some Difference: And all *Gavel-kind* Land in *Wales* are made defendable to the Heirs, according to the Course of the Common Law. In *Gavel-kind*, tho' the Father be hang'd, the Son shall inherit; for their Custom is,

The Father to the Bough, the Son to the Plough.

GAUGE-POINT, of a Solid Measure, is the Diameter of a Circle, whose Superficial Content is equal to the Solid Content of the same Measure: Thus, the Solid Content of a Wine Gallon being 231 Cubick Inches, if you conceive a Circle to contain so many Inches, you may easily find the Diameter of it; which shall be the *Gauge-Point* for Wine Measure: After the like Manner the *Gauge-Point* for Ale Measure, &c. is found. Vid. *Windgate's Rule of Proportion*, Ch. 10.

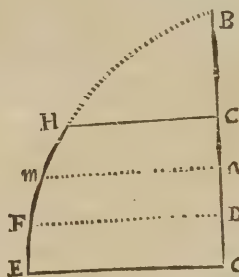
GAUGING, is the finding the Capacities or Contents of all sorts of Vessels which hold Liquids, Powders, Meal, Corn, &c.

If these are of a Square form like hollow Cubes or Parallelopipids, &c. such as many sorts of *Bucks*, *Coolers*, *Fats*, &c. their Content is easily found, by multiplying the Area of the Base by the perpendicular Altitude, as you find the Solidity of Parallelopipids and Prisms.

If they are of a Cylindrical Figure, as *Bushels*, *Gallons*, &c. you must, as near as you can, find the Area of the Circular Base, and multiply that by the perpendicular Altitude as before.

If they are *Casks* of the usual Form of our *Hogheads*, *Barrels*, &c. Mr. *Oughtred* considers them as Segments of a *Spheroid*, cut off by two Planes perpendicular to the Axis.

And then Mr. *Caswell* thus easily deduces his Theorem for measuring Wine and Ale Casks:



Suppose *CEB* a Quadrant of an Ellipsis, whose Semi-Axes are *CB* and *CE*; and let the Ratio of the Semi-Parameter to *CB*, be as *l* to *t*: And let *EC*, *ED*, *mm*, *HG*, be considered as the Radii of Circles, which when turned round the Axis, *BC* shall form a *Spheroid*: Therefore the Elemental Circle

$$\begin{aligned} DF &= l \\ \odot nM &= \frac{1}{t} \times \odot CB - \odot CD \\ \odot GH &= t \times \odot CB - \odot CG \end{aligned}$$

Wherefore, the Frustum of the Spheroid is

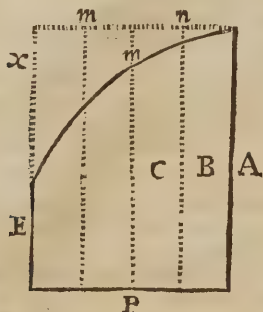
$$\frac{1}{2} p \times CB - \frac{1}{2} \odot CG : = \frac{1}{2} p \times \frac{1}{t} \odot CB - \frac{1}{2} \odot CG = \frac{1}{2} p \times 2 \odot CE + \odot HG$$

Which

Which last is Mr. Oughtred's Theorem; in Words thus:

Add twice the Area of the Circle at the Bung, to the Area of the Circle of the Head; and then multiply that Sum by one Third of the Length of the Cask, (which p stands for here, as being a Perpendicular to the Planes of these Circles) the Product is the Content of the Vessel in Cubick Inches.

But perhaps, saith Mr. Caswell, most of our Casks had better be considered as *Frusta* of a *Parabolick Spindle*; and then the Ground of their Mensuration he thus deduces.



Suppose A the Axis of a Parabola, and P an Ordinate to that Axis, divided into innumerable Parts by $B, C, \&c.$ drawn parallel to the Axis, whose Differences from A , suppose $n, m, \&c.$

$$\text{That is, } \begin{cases} B = A - n \\ C = A - m \\ E = A - x \end{cases}$$

$$\text{Therefore } \begin{cases} B^2 = A^2 - 2An + nn \\ C^2 = A^2 - 2Am + mm \\ E^2 = A^2 - 2Ax + xx \end{cases}$$

But $A^2, A^2, \&c.$ is a Series of Equals, therefore $= p A^2$, and $2An, 2Am, \&c.$ (by the Nature of the Parabola) is a Series of *Secundans*, therefore $= p \times \frac{2}{3} Ax$. And nn, mm, xx , is a Series of *Quartans*, therefore $= \frac{1}{4} p xx$.

Therefore the Frustum of a *Pyramidoid*, made of $A^2, B^2, C^2, \&c.$ is $= P \times A^2 - \frac{2}{3} Ax + \frac{1}{4} xx = \frac{1}{3} P x : \frac{2}{3} xx + 2A^2 + (A^2 - 2Ax) = E^2 - xx = \frac{1}{3} P x : 2A^2 + E^2 - \frac{2}{3} xx$.

Therefore if a Segment of a *Parabola*, cut off by a Line parallel to the Axis, be turn'd about its ordinate Applycate P , the Frustum of the Acute *Parabolick Conoid*, so generated, or as some call it, a *Parabolick Spindle*, is $= \frac{1}{3} P x : 2A^2 + E^2 - \frac{2}{3} xx$.

So that the Frustum of a *Parabolick Spindle*, is less than the Frustum of the *Spheroid* of the same Base and Height by $\frac{2}{3} \times \frac{1}{3} P$; and for the most Part gives the Capacity of Casks nearer the Truth than the Theorem of *Oughtred*, who supposes Casks to be *Frusta* of *Spheroids*; or than that of others, by multiplying the Circles at the Bung and Head into half the Length of the Cask, which supposes it to be a *Parabolick Conoid*: Or lastly, than with others,

to suppose them for *Frusta* of *Cones*, which is farthest of all from the Truth.

The Common Rule for all Ale or Wine Casks, is to take the Diameters at the Bung and at the Head; by which you must find the Areas of the Circle there; then you must take $\frac{2}{3}$ of the Area of the Circle at the Bung, and $\frac{1}{3}$ of the Area of the Circle at the Head, and add them together into one Sum, which Sum multiplied by the internal Length of the Cask, gives the Content, in Solid Inches: Which you may turn into Gallons, by dividing by 282 for Ale, and 231 for Wine Gallons.

But certainly, 'tis easier and shorter to use the Theorem, as Mr. Oughtred expresses it, as above-said, viz, $\frac{1}{3} p \times 2 \odot CE + HG$, than to make Fractions of the Areas of those Circles, as in the common way.

GAYNAGE, in our Law, signifies most properly the Profit that comes by the Tillage of the Land held by the baser kind of Soke-men.

GAZONS, in Fortification, are Pieces of fresh Earth covered with Grass cut in Form of a Wedge, about a Foot long, and half a Foot thick, to line Parapets and the Transverses of Galleries.

GEMELLES, the Term in Heraldry for the bearing of Bars by Pairs or Couples in a Coat of Arms: As,

He beareth Gules on a Chevron Argent, three Bars Gemelles Sable, by the Name of *Throgmorton*.



GEMELLUS, is a Muscle of the Cubit, so called from its double Origine; it ariseth first Tendinous from the superior Part of the inferior *Costa* of the *Scapula* internally, and as it passeth between the two round Muscles, it grows Flethy, and in its Descent joineth with its other Beginning, which arises broad and Flethy from the upper and back-part of the *Os Humeri*, under the Deltoid Muscle; and being Tendinous on the outside, and Flethy within, is so inserted to the superior and external Part of the *Ulna*, called *Olecranon* and *Ancon*, or the Elbow. Its Use is to extend the Cubit: If we examine the two Beginnings of this Muscle, we shall find them interwoven with various Orders of Fibres, whereby it is rendred capable of performing the Extension of the Cubit with a greater Strength; which appears in Tumblers when they are walking on their Hands, who by an immediate Extension of their Cubits, can return to their Feet.

GEMINI, a Muscle serving to move the Thigh outwards.

GEMINI, one of the 12 Signs of the Zodiack, being the Third in Order; also a Constellation of that Name.

GEMINOUS Arteries, so some call the two small Arteries which defend to the Joint of the Knee, between the Processes of the Thigh-bones.

GEMMA, among the Botanists, is the Turgid Bud of any Tree when it is beginning to bear: 'Tis called also *Oculus*.

GENA Mala, is the Part of the Face from the Nose to the Ears: Also the Chin and the Jaw-bone is sometimes so called, which is either upper, or lower. *Blanchard*.

GENERATING Line or Figure, in Geometry, is that which by its Motion or Revolution produces any other Figure Plane or Solid. Thus a Right Line moved any way parallel to itself, generates a Parallelogram; if round a Point in the same Plane, with one End fastened in that Point, it generates a Circle.

One entire Revolution of a Circle in the same Plane, generates the Cycloid; the Revolution of a Semi-circle round its Diameter, generates a Sphere, &c. Sir Isaac Newton uses the Word

GENERATED, or *Genited Quantity*, in a very large Sense, for whatever is produced either in Arithmetick by the Multiplication, Division, or Extraction of Roots; or in Geometry by the Invention of the Contents, Areas, and Sides; or of Extream and Mean Proportionals, without Addition and Subtraction.

GENERATION, is the Production of any thing in a Natural Way, which before was not in Being: For when in any Parcel of Matter there is produced such a Concurrence of all those Accidents which ('tis agreed) are necessary and sufficient to constitute a *determinate Species* of things Corporeal; we then say a Body belonging to that Species is generated. So that here, properly speaking, no *New Substance*, but only a new *Essential Denomination, Modification, or Manner of Existence* is produced or generated: And when that Union of Accidents which denominates a Body generated, is destroyed and dissolved, that Body losing its Essential Modification is said to be Corrupted.

GENEROUSA, a Law Term for a Gentlewoman; if she be really so, and named *Spinster* in any Original Writ, Appeal, or Indictment, she may abate and quash the same; for she hath as good Right to that Addition, as a Barones or Dutches have to theirs: The same may be said of *Generosus*, a Gentleman. 2 Inst. 668.

GENESIS, in Geometry, is the Formation of any Plane or Solid Figure by the Motion of some Line or Surface, which Line or Surface is always called the *Describent*; and that Line according to which the Motion is made, is called the *Dirigent*.

GENICULUM, in Botany, is the Knot or Joint in the Stalk of any Plant.

GENIOGLOSSUM, is a Pair of Muscles proceeding inwardly from the Fore-part of the Lower Jaw, under another Pair called *Geniohyoides*, and enlarging themselves, are fastened into the Basis of the Tongue: These serve to pull the Tongue forward, and to thrust it out of the Mouth.

GENIOHYOIDEUS, is a Muscle of the *Os Hyoides*, which, with its Partner, is short, thick, and fleshy, arising from the internal Parts of the Lower Jaw-bone called the Chin, and dilating themselves, are soon lessened again, and inserted to the superior Part of the Fore-bone of the *Os Hyoides*. These acting, pull the *Os Hyoides*, &c. both upwards and forwards, and assist the *Genioglossa* in thrusting the Tongue out of the Mouth.

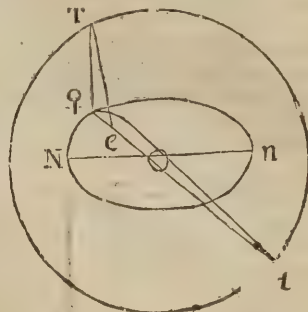
GENUS, in Logick, is an Idea so common and universal, that it extends its self also to other *Universal Ideas*. Thus a Right-lined Figure of four Sides, is a *Genus*, in respect of a *Parallelogram* or a *Trapezium*. And in like manner Substance is the same in respect of *Substance extended*, which is a Body; and *Thinking Substance*, which is a Spirit. The Logicians divide *Genus* into *Summum* or the highest *Genus*, which hath nothing above it to be a *Species* of: And *Subalternate*, which is sometimes, or in some respects, a *Genus*, and in others a *Species*.

GEOCENTRICK, signifies any Planet or Orb that has the Earth for its Center, or the same Center with the Earth.

GEOCENTRICK Latitude of a Planet, is its Latitude seen from the Earth; or the Inclination of a Line connecting the Planet and the Earth, to the Plane of the Earth's (or true) Ecliptick: Otherwise

'tis the Angle which the aforesaid Line (connecting the Planet and the Earth) makes with the Line, which is drawn perpendicular to the Plane of the Ecliptick.

Thus in the Figure annexed, the Angle $\angle T e$ is the Measure of the Planet φ , her Geocentrick Latitude when the Earth is in T , and the Angle $\angle e \varphi$, the Measure of it when the Earth is in t .



GEOCENTRICK Place of a Planet, is such as it would appear to us from the Earth, if our Eye were there fixed.

GEODÆSIA, Surveying, or the Art of measuring Land: See Surveying.

GEODÆTICAL Numbers, are such as are considered according to those Vulgar Names or Denominations, by which Money, Weights, Measures, &c. are generally known, or particularly divided by the Laws and Customs of several Nations.

GEOGRAPHICAL Mile, is the *Sea Mile*, or *Minutes*, being one 60th Part of a Degree of a great Circle on the Earth's Surface.

GEOGRAPHY, is a Description of the whole Globe of the Earth, or known Habitable World; together with all its Parts, Limits, Situations, and other remarkable things relating thereto.

GEOMETRICAL, or *Algebraical Curves*, are such, as that when their Nature or Property comes to be expressed by an Equation, the two variable Quantities in that Equation (as x and y , the *Abscissa* and *Ordinate*, are called in the Doctrine of Fluxions) are both, or do both denote straight Lines, then that is truly a Geometrical or Algebraical Curve.

But when one of the Variable or Flowing Quantities in such an Equation denotes a *Curve-Line*, then that Curve is called a *Transcendent Curve*.

GEOMETRICAL-PLANE: See Plane.

GEOMETRICAL Progression or *Proportion*: See Progression.

GEOMETRICAL Solution of a Problem, is when the Thing is solved according to the Rules of Geometry, and by such Lines as are truly Geometrical and agreeable to the Nature of the Problem.

Thus *Des Cartes's* Way of finding two Mean Proportionals is a *Geometrical Solution*, because done according to the Nature of the Problem, which is a Solid one; and also because performed by the *Periphery* of a Circle and the *Parabola*, which are truly Geometrical Curves, and agreeable to the Nature of the proposed Problem: But then the Solution of it by *Diocles* is not *Geometrical*, because both the *Cissoid* (by which he performs it) is no true Geometrical Curve, and also being a Line of the *Second Gender* (as they call it) it is proper only to a *Surfsolid Problem*.

GEOMETRICK Places: See *Places Geometrical*.

GEOMETRY, originally signifies the Art of measuring the Earth, or any Distances or Dimensions on or within it; but 'tis now used for the *Science of Quantity, Extension, or Magnitude, abstractedly considered, without any regard to Matter*.

Geometry, very probably, had its first Rise in *Egypt*, where the Nile annually overflowing the Country, and covering it with Mud, obliged Men to distinguish their Lands one from another, by the Consideration of their Figure; and to be able also to measure the Quantity of it, and to know how to plot it and lay it out again in its just Dimensions, Figure, and Proportion: After which 'tis likely a farther Contemplation of those Draughts and Figures, help'd them to discover many excellent and wonderful Properties belonging to them, which Speculation continually was improving, and is still to this very Day.

GEOMETRY is usually divided into *Speculative* and *Practical*: The former of which contemplates and treats of the Properties of continued Quantity abstractedly: And the latter applies these Speculations and Theorems to Use and Practice, and to the Benefit and Advantage of Mankind. See Vol. II.

GERMINATION, is the growing or sprouting out of Vegetables, or of any Parts of them.

GIBBOUS, is a Term used in reference to the enlightened Parts of the Moon, while she is moving from Full to the First Quarter, and from the last Quarter to Full again; for all that Time the dark Part appears horned and *falcated*, and the light one bunched out, Convex, or *Gibbous*.

GIFT-ROPE, is the Boat-Rope, which is fastened to the Boat when she is *swifted*, in order to her being towed at the Stern of a Ship.

GILD, or *Guild*, in Law, signifies a Tribute, or sometimes an Amerciament; and sometimes also a Fraternity or Company combined together, with Orders and Laws made among themselves by the Prince's License.

GILLA Vitrioli, is only a Purification of White Vitriol, by dissolving it in the Phlegm of Vitriol, and then filtrating the Solution, and either crystallizing it, or evaporating *ad siccitatem*, to gain the Salt or *Gilla*, which accordingly will be in the Form either of Crystals, or a dry Salt at the Bottom.

GINGLIMUS, is an Articulation of a Bone when it both receives and is received: Of this Articulation there are three sorts.

The First is when the End of a Bone has two Protuberances and one Cavity, and the End of the Bone which is articulated with it has two Cavities and one Protuberance, as the *Humerus* and the *Ulna*; or when a Bone at one Extremity receives another Bone, and at its other Extremity it is received by the same Bone, as the *Radius* and *Ulna*.

The Second Sort is when a Bone at one End receives another Bone, and at the other End is received by a third Bone, as the *Vertebrae* do.

The Third is when a Bone has a Cavity which receives the long Process of another Bone, which Process turns in the Cavity like the Axle-tree in a Wheel, as the second *Vertebra* of the Neck is articulated with the first; but this is no true *Ginglimus*.

GIRDING-GIRT: The Seamen say a Ship is *Girt*, or hath a *Girding-Girt*, when her Cable is so tight, or strained, that upon the running of the Tide, she cannot go over it with her *Stern part*, but will lie a-cross the Tides.

GIVEN, is a Word often used in Mathematicks, and signifies something which is supposed to be

known: Thus, if a Magnitude be known, or that we can find another equal to it, they say, 'Tis a *given Magnitude*, or that such a thing is *given in Magnitude*. If the Position of any thing be supposed as known, they say, *Given in Position*: Thus, if a Circle be actually described upon any Plane, they say, its Center is *given in Position*; its Circumference is *given in Magnitude*; and the Circle both in *Position* and *Magnitude*. But a Circle may be *given in Magnitude only*; as when only its Diameter is given, but the Circle not actually described. If the Kind or Species of any Figure be given, they say, *Given in Specie*. If the Ratio between any two Quantities is known, they are said to be *given in Proportion*. See *Barrow's* Definitions and Propositions of *Euclid's Data*, at the End of the Elements put forth by that Great Geometrician, Anno 1678.

GLACIALIS Humor: See *Humores Oculi*.

GLACIATION, the turning of Water, or any other Liquor, into Ice: See *Freezing*.

GLACIS, a sloping Bank in Fortification: It signifies a very gentle Steepness, but is more especially taken for that which rangeth from the Parapet of the *Cover'd-way* to the Level on the Side of the Field.

GLAND: See *Glandula*.

GLANDULA: A *Glandule* is a Substance of a peculiar Nature, Flethy, White, or Gray; and it is two-fold: *Adventitious*, as those Kernels which are sometimes under the Arm-holes, and in the Neck, as the *King's-Evil*; a Swelling in the *Larynx* and middle of the Wind-pipe, &c. Or *Perpetual and Natural*, as the *Thymus*, *Pancreas*, *Glandula Pinealis*, &c. The *Perpetual* is again two-fold, either *Conglobated* in one entire Piece, which sends the separated Humour into the Veins, as the *Pituitary Glandule*, the *Pinealis*, the Glandules of the Mesentery, of the Groins, &c. Or *Conglomerated* in a Cluster, which convey the Juice by their own Channels into some notable Cavities of the Body; as the *Pancreas*, the Glandules of the *Breast*, the *Salivary Glandules*, &c.

There are also discovered by Dr. *Haver's* a sort of Glands, which he calls *Mucilaginous Glands*; which see under *Mucilaginous*.

GLANDULA Guidonis, is a Tumor like a *Glandula*, soft, single, moveable, without Roots, and separated from the adjacent Parts.

GLANDULA Pinealis: See *Conarium*.

GLANDULA Pituitaria, is a little Body in the *Sella Equina*, a Place in the Brain so called, cover'd over with the *Rete Mirabile* in many Brutes, but not in Men: It receives the Serous Humour from the *Infundibulum* and the *Rete Mirabile*, which it sends into the Jugular Veins and the Lymphatick Vessels.

GLANDULÆ Lumbares, are three Glands described by *Bartholin*, and by him so named, by reason of their lying upon the Loins: He thus describes them, *Pag. 191. of his Anat. Edit. 1674*.

The two largest lie one upon another betwixt the descending *Cava* and *Aorta*, in that Angle which the Emulgents make with the *Cava*: The third being smaller stands over these, under the Appendices of the Diaphragm. They have Communication, or are knit to one another by small Lacteal Branches, especially the two larger.

He once thought them to supply the Place of the common Receptacle in Man; that not being so plain in him as in several Brutes: But since a Receptacle is acknowledg'd as well in Men as Brutes, Dr. *Wharton's* Opinion concerning their Use seems more probable, *viz.*

That they supply the Place of those larger Glands that are found in the Mesenteries of Brutes, but are not Natural to Men: And for this Reason he presumes, That all such Animals as want those greater Glands in the Mesentery, have these *Lumbares* as well as Men.

GLANDULÆ Otoriferae are certain small Glandules discovered by that Accurate Anatomist Dr. Tyson, in that Part of the *Penis* where the *Preputium* is contiguous to the *Balamus*; and he gives them this Name from the great Scent which their separated Liquor emits: In such Persons as have the Prepuce longer than ordinary, these Glands are not only more, but larger, and separate a greater Quantity of their Juice, which lodging there, often grows Acid, and corrodes the Glands: These are very conspicuous in most Quadrupeds, especially in Dogs and Boars.

GLANDULÆ Renales, seu Capsula Atrabiles, are Glands which lie between the *Aorta* and the Kidneys, a little above the Emulgent Vessels: They are two in Number, one on each Side, wrap'd up in Fat: They sometimes change their Situation, and their Figure is also various; for in some they are Round, in others Oval, Square, Triangular, of a Trapezial or Irregular Figure; the Right is ordinarily bigger than the Left, and each about the Bigness of a *Nux Vomica*. Their Use is not certainly known; they seem to separate a Liquor from the Arterial Blood before it goes to the Kidneys, for the liquifying the Blood which is thick after it comes from them.

GLANS, in Botany, is that which being contained within a smooth but hard Bark, and containing but one Seed, hath its Hinder-Part (which adheres to the Tree) covered with a kind of Cup, while the Fore-part is bare; as Acorns, &c. but properly *Glans* is the Fruit without the Cup.

GLANS, the same with *Balamus* and *Suppositorium*.

GLANDULUM Corpus, the same with *Prostata*.
GLANDULOSA Tunica Intestinorum: See *Papilla Intestinorum*.

GLASS of Antimony: See *Regulus of Antimony*.

GLASSY Humour of the Eye: See *Vitreous Humour*.

GLASSY Tunicle: See *Vitreous Tunicle*.

GLAUCOMA, is a Fault in the Eye, or a Transmutation of the Crystalline Humour into a Gray or Sky Colour.

GLAUCOSIS, the same with *Glaucoma*.

GLEBE-LAND, Church-Land, is most commonly taken for Land belonging to a Parish-Church beside the Tythe.

GLENE, the same with *Pupilla*; also the Cavity of a Bone which receives another within it.

GLENOIDES, are two Cavities in the lower Part of the first Vertebre of the Neck.

GLOBE or *Sphere*, is a round solid Body, every Part of whose Surface is equally distant from a Point within it, called its Center: and it may be conceived to be formed by the Revolution of a Semicircle round its Diameter.

When such a Body as this hath all the Parts of the Earth and Sea drawn or delineated on its Surface, like as in a Map, and placed in their Natural Order and Situation, it is called the *Terrestrial Globe*.

But if on its Surface it hath the fixed Stars and the Images of the Constellations drawn, together with the Circles of the Sphere below described, 'tis then called the *Celestial Globe*.

And when the following Circles are supposed to be described on the Convex Surface of a Sphere,

which is hollow within, and after this you imagine all Parts of the Sphere's Surface to be cut away, except those Parts on which such Circles are described, then that Sphere is called an *Armillary Sphere*, because it appears in the Form of several Circular Rings or Bracelets put together in a due Position.

There are Ten Eminent Circles upon the Globe or of the Sphere; Six of which are called *Greater*, and the Four other *Lesser Circles*.

A *Great Circle* of the Sphere is that whose Plane passeth through the Center of the Sphere, and divides it into two equal Parts or Hemispheres.

A *Lesser Circle* is that which is parallel to a *Greater*, as the *Tropicks* and the *Polar Circles* are to the *Equator*, and as the *Circles of Altitude* are to the *Horizon*.

Or *Lesser Circles* are such as do not divide the Globe into two equal Parts.

The *Greater Circles* are,

I. The *Horizon*, which is a broad wooden Circle encompassing the Globe round about, having two Notches, the one in the North, the other in the South Part of it, for the Brazen *Meridian* to stand in.

There are usually accounted two *Horizons*:

First, The *Visible*, or *Sensible*, which you may conceive to be made by some great Plain, or the Surface of the Sea; and which divides the Heavens into two *Hemispheres*, the one above, the other (apparently) below the Level of the Earth.

This Circle determines the Rising and Setting of the Sun, Moon, or Stars, in any particular Latitude; for when any one of them comes just to the Eastern Edge of the *Horizon*, then we say it Riseth; and when it doth so at the Western Edge, we say it Setteth. And from hence also the Altitude of the Sun and Stars is accounted, which is their Height in Degrees above the *Horizon*.

II. The other *Horizon* is called the *Real* or *Rational*, and is a Circle which encompasses the Earth exactly in the Middle, and whose Poles are the *Zenith* and *Nadir*; that is, two Points in its Axis, each 90 Degrees distant from its Plain (as the Poles of all Circles are) and the one exactly over our Heads, and the other directly under our Feet. This is the Circle which the Wooden *Horizon* on the Globe represents.

On which *Broad Horizon* several Circles are drawn, the innermost of which is the Number of Degrees of the *Twelve Signs* of the *Zodiack*, viz. 30 to each Sign: For the Ancient Astronomers observed the Sun in his (apparent) Annual Motion, to describe always one and the same Line in Heaven, and never to deviate from this Track or Path to the North or South, as all the other Planets did more or less; and because they found the Sun also to shift, as it were backward, through all the parts of this Circle or Path, so that in his whole Year's Course he would *Rise*, *Culminate*, and *Set* with every Point of it; they distinguished the fixed Stars that appeared in or near this Circle into *Twelve Constellations* or Divisions, which they called *Signs*; and because they were most of them usually drawn in the Form of Animals, they called this Circle by the Name of the *Zodiack*, and the very middle Line of it the *Ecliptick*: And since every Circle was divided into 360 Parts or Degrees, a twelfth

twelfth Part of that Number must be 30, the Degrees in each Sign.

Next to this you have the Names of those Signs ; next to this the Days of the Month, according to the *Julian Account*, or *Old Stile*, with the *Calendar* ; and then another *Calendar* according to the *Foreign Account*, called the *New Stile*.

And without there is a Circle divided into Thirty two equal Parts, which make the Thirty two Rhombs or Points of the Mariner's Compass, with the first Letters of the Names annexed ; and since a Thirty second Part of 360 Degrees is 11 Degrees 15 Minutes, they account that each single Point of the Compass is 11 Degrees 15 Minutes.

The Uses of this Circle in the Globe are,

1. To determine the Rising and Setting of the Sun, Moon, or Stars, and to shew the Time of it by the help of the Hour-Circle and Index ; as shall be shewed hereafter.

2. To limit the Increase and Decrease of the Day and Night : For when the Sun rises due East, and sets West, the Days are equal.

But when he Riseth and Setteth to the North of the East and West, the Days are longer than the Nights ; as on the contrary, the Nights are longer than the Days, when the Sun Riseth and Setteth to the Southward of the East and West Points of the Horizon.

3. To shew the Amplitude of the Sun, or of any Star ; and also, on what Point of the Compass it Riseth and Setteth.

II. The next *Great Circle* is the *Meridian*, which is represented by the Brazen Frame or Circle in which the Globe hangs and turns : This is divided into four Nineties, or 360 Degrees, beginning at the *Equinoctial*. 'Tis called the *Meridian*, because when the Sun comes to the South Part of this Circle, 'tis then *Meridies*, *Mid-Day*, or *High-noon*, and then the Sun hath its greatest Altitude for that Day, which therefore is called the *Meridian Altitude*. The Plane of this Circle is perpendicular to the *Horizon*, and passeth through the South and North Points thereof through the *Zenith* and *Nadir*, and through the Poles of the World. In it, each way from the *Equinoctial* on the *Celestial Globe*, is accounted the North or South Declination of the Sun or Stars ; and on the *Terrestrial*, the Latitude of a Place North or South ; which is all one Quantity with the Elevation or the Height of the Pole above the Horizon : Because the Distance from the *Zenith* to the *Horizon*, being the same as that between the *Equinoctial* and the *Poles*, if from each you imagine the Distance from the *Pole* to the *Zenith* to be taken away, the Latitude must remain equal to the *Pole's Height*.

There are Two Points of this Circle, each 90 Degrees from the *Equinoctial*, which are thence the *Poles of the World* ; and a Diameter from thence continued through the Center of either Globe, is called the *Axis of the Earth or Heavens*, on which they are supposed to turn round.

These *Meridians* are various, and change according to the Longitude of Places ; for as soon as ever a Man moves but one Degree, or but a Point to the East or West, he is under a new Meridian : But there is (or should be) one fix'd, which is called the *First Meridian*.

And this on some Globes passes through *Gratiosa*, one of the *Azores* Islands ; but the French place the first Meridian at *Fero*, one of the *Canary* Islands.

The Poles of the Meridian are the East and West Points of the Horizon.

On the *Terrestrial Globe* there are usually drawn Twenty four Meridians, one through every 15 Degrees of the Equator, or through every 15 Degrees of Longitude.

The Uses of this Circle are,

First, To set the Globe to any particular Latitude, by a proper Elevation of the Pole above the Horizon of that Place : And,

Secondly, To shew the Sun or Stars Declination, right Ascension, and greatest Altitude ; of which more below.

III. The next *Great Circle* is the *Equinoctial*, as it is called on the Celestial, and *Equator* on the Terrestrial Globe. This is a great Circle, whose Poles are the Poles of the World : It divides the Globe into two equal Parts or Hemispheres, as to North and South ; and it passes through the East and West Points of the Horizon, and at the Meridian is always as much raised above the Horizon, as is the Complement of the Latitude of any particular Place. Whenever the Sun cometh to this Circle, it makes equal Days and Nights all round the Globe, because it always Riseth then due East, and Sets due West, which it doth at no other Time of the Year. All Stars also which are under this Circle, or which have no Declination, do always Rise due East, and Set full West.

All People living under this Circle (which in Geography, or rather by Navigators, is called the *Line*) have the Days and Nights constantly equal ; and when the Sun is in the Equinoctial, he will be at Noon in their Zenith, or directly over their Heads, and so their erect Bodies can cast no Shadow.

From this Circle, both ways, the Sun or Star's Declination on the Celestial, or Latitude of all Places on the *Terrestrial Globe*, is accounted on the Meridian : And such lesser Circles as run through each Degree of Latitude or Declination parallel to the Equinoctial, are called *Parallels of Latitude*, or *Parallels of Declination*.

Through every 15 Degrees of this Equinoctial the Hour-Circles are drawn at Right Angles to it on the *Celestial Globe*, and all pass through the Poles of the World, dividing the Equinoctial into 24 equal Parts.

And the *Equator* on the *Terrestrial Globe* is divided by the Meridian into 36 equal Parts ; which Meridians are equivalent to the Hour-Circles on the other Globe.

IV. The *Zodiack* is another *Great Circle* of the *Sphere*, dividing the Globe into two equal Parts : When the Points of *Aries* and *Libra* are brought to the Horizon, it will cut that and the Equinoctial obliquely, making with the former an Angle equal to the Sun's greatest Meridian Altitude in any Latitude ; and with the Equinoctial, an Angle equal to 23 Degrees and 30 Minutes, which is the Sun's greatest Declination. This Circle by Astronomers is accounted as a kind of broad one, and is like a Belt or Girdle round the Globe : Through the Middle of it is drawn a Line called the *Ecliptick*, or *Via Solis*, the *Way of the Sun* ; because the Sun never deviates from it in its Annual Motion, as the Planets do all more or less, where it hath its Breadth.

This Circle is mark'd with the Characters of the *Twelve Signs*, and on it is found out the Sun's Place, which

which is under what Star or Degree of any of the *Twelve Zodiacal Constellations* he appears to be at Noon. By this are determined the Four Quarters of the Year, according as the Ecliptick is divided into four equal Parts; and according as the Sun goes on here, he hath more or less Declination.

Also from this Circle the Latitude of the Planets and fixed Stars are accounted from the Ecliptick towards its Poles.

The Poles of this Circle are 23 Degrees 30 Minutes distant from the Poles of the World, or of the Equinoctial, and by their Motion round the Poles of the World, are the Polar Circles described.

In these Poles of the Ecliptick all the Circles of Longitude which are drawn through the Zodiac do determinate, as the *Meridians* and *Hour-Circles* do in the Poles of the World, and as the *Azimuth* or *Vertical Circles* do in the *Zenith* and *Nadir*.

V. If you imagine two *Great Circles* passing both through the Poles of the World, and also one of them through the *Equinoctial Points*, *Aries* and *Libra*, and the other through the *Solstitial Points*, *Cancer* and *Capricorn*:

These are called the two *Colures*, the one the *Equinoctial*, the other the *Solstitial Colure*. These will divide the Ecliptick into four equal Parts or Quarters, which are denominated according to the Points where these pass through, called the four Cardinal Points, and are the first Points of *Aries*, *Libra*, *Cancer*, and *Capricorn*.

These are all the Great Circles.

VI. If you suppose Two Circles drawn parallel to the Equinoctial, at 23 Degrees 30 Minutes distant from it, one towards the North, the other towards the South, these are called the *Tropicks*, because the Sun appears, when in them, to turn backward from his former Course; the one the *Tropick of Cancer*, and the other, the *Tropick of Capricorn*, because they are under these Signs.

VII. If two other Circles are supposed to be drawn through 23 Degrees 30 Minutes, reckoned on the Meridian from the Polar Points, these are called the *Polar Circles*: The Northern is the *Arctic*, and the Southern the *Antarctic* Circles, because opposite to the former:

These are the Four Lesser Circles.

And these on the *Terrestrial Globe* the Ancients supposed to divide the Earth into five *Zones*, viz. two *Frigid*, two *Temperate*, and the *Torrid Zone*.

Besides these Ten Circles lately described, which are always drawn on the Globe it self, there are some other necessary Circles to be known, which are barely imaginary, and supposed only to be drawn upon the Globe.

1. *Meridians*, or *Hour-Circles*, which are great Circles meeting all in the Poles of the World, and crossing the Equinoctial at Right Angles; these are supplied by the Meridian, Hour-Circle, and Index.

2. *Azimuths*, or *Vertical Circles*, which likewise are *Great Circles of the Sphere*, and meet in the *Zenith* and *Nadir*, as the *Meridians* and *Hour-Circles* do in the Poles: These cut the Horizon at Right Angles, and on these is reckoned the Sun's Altitude when he is not in the Meridian. They are represented by the Quadrant of Altitude, which being fixed at the Zenith, is moveable about round the Globe through all the Points of the Compass.

3. There are also *Circles of Longitude* of the Stars and Planets, which are Great Circles passing through

the Pole of the Ecliptick, and in that Line determining the Stars or Planets Place or Longitude reckoned from the first Point of *Aries*.

4. *Almacanters*, or *Parallels of Altitude*, are Circles having their Poles in the Zenith, and are always drawn parallel to the Horizon. These are *Lesser Circles of the Sphere*, diminishing gradually as they go farther and farther from the Horizon.

In respect of the Stars there are also supposed to be *Parallels of Latitude*, which are parallel to the Ecliptick, and have their Poles the same with those of that Circle.

5. *Parallels of Declination* of the Sun or Stars, which are lesser Circles, whose Poles are the Poles of the World, and are all drawn parallel to the Equinoctial, either North or South; and these (when drawn on the *Terrestrial Globe*) are called *Parallels of Latitude*.

DEFINITIONS.

1. *Latitude of any Place*, is an Arch of the Meridian of that Place, intercepted between its Zenith and the Equator; and this is the same with an Arch of the Meridian, intercepted between the Pole and the Horizon; and therefore it is often expressed by the Poles Height, or Elevation of the Pole: The Reason of which is, That from the Equator to the Pole, there always being the Distance of 90 Degrees, and from the Zenith to the Horizon the same Number, and each of these 90 Degrees containing within it the Distance between the Zenith and the Pole; that Distance therefore being taken away from both, must leave the Distance from the Zenith to the Equator, equal to the Distance between the Pole and the Horizon, or to the Elevation of the Pole above the Horizon.

2. *Latitude of a Star or Planet*, is an Arch of a Great Circle reckoned on the Quadrant of Altitude, laid through the Star and Pole of the Ecliptick, from the Ecliptick towards its Pole.

3. *Longitude of a Place*, is an Arch of the Equator intercepted between the Meridian of the Place and the first Meridian: Or it is more properly the Difference, either East or West, between the Meridians of any two Places, accounted on the Equator.

4. *Longitude of a Star*, is an Arch of the Ecliptick, accounted from the beginning of *Aries* to the Place where the Stars Circle of Longitude crosseth the Ecliptick; so that it is much the same as the Stars Place in the Ecliptick, accounted from the beginning of *Aries*.

5. *Amplitude of the Sun*, or of a *Star*, is an Arch of the Horizon intercepted between the true East or West Points of it, and that Point upon which the Sun or Star rises or sets.

6. *Right Ascension of the Sun*, or of a *Star*, is that part of the Equinoctial reckoned from the beginning of *Aries*, which riseth or setteth with the Sun or Star in a Right Sphere: But in an Oblique Sphere it is that Part or Degree of the Equinoctial which comes to the *Meridian* with it, (as before) reckoned from the beginning of *Aries*.

1. *A Right or Direct Sphere*, is when the Poles are in the Horizon, and the Equator in the Zenith. The Consequence of being under such a Position of the Heavens as this (which is the Case of those who live directly under the Line) is, That the Inhabitants have no Latitude nor Elevation of the Pole: They can nearly see both the Poles of the World: All the

Stars

Stars in the Heavens do once in 24 Hours Rise, Culminate, and Set with them; the Sun always Rises and Descends at Right Angles with the Horizon, which is the Reason they have always equal Day and Night, because the Horizon doth exactly bisect the Circle of the Sun's Diurnal Revolution.

2. *A Parallel Sphere*, is where the Poles are in the Zenith and Nadir, and the *Equinoctial* in the Horizon; which is the Case of such Persons, if any such there be, who live directly under the North or South Poles.

And the Consequences of such a Position are, That the Parallels of the Sun's Declination will also be Parallels of his Altitude, or Almucanters to them. The Inhabitants can see only such Stars as are on their Side the Equinoctial; and they must have 6 Months Day, and 6 Months continual Night every Year; and the Sun can never be higher with them than 23 Degrees 30 Minutes (which is not so high as it is with us on *February 10th*.)

3. *An Oblique Sphere*, is where the Pole is elevated to any Number of Degrees less than 90: And consequently the Axis of the Globe can never be at Right Angles to, nor in the Horizon; and the Equator, and Parallels of Declination, will all cut the Horizon Obliquely, from whence it takes its Name.

Oblique Ascension of the Sun, or Stars, is that Part or Degree of the Equinoctial reckoned from the beginning of *Aries*, which Rises and Sets with them in an Oblique Sphere.

Ascensional Difference, is the Difference between the Right and Oblique Ascension, when the Lesser is subtracted from the Greater.

On the Terrestrial Globe.

1. A Space upon the Surface of the Earth, reckoned between two Parallels to the Equator, wherein the Increase of the longest Day is a Quarter of an Hour, is by some Writers called a *Parallel*.

2. And the Space contained between two such Parallels, is called a *Climate*: These *Climates* begin at the Equator; and when we go thence North or South, till the Day become half an Hour longer than it was before, they say, we are come into the *First Climate*; when the Days are an Hour longer, than they are under the Equator, we are come to the *Second Climate*, &c. These *Climates* are accounted in Number 24, reckoned each way towards the Poles.

The Inhabitants of the Earth are divided into three Sorts, as to the falling of their Shadows.

1. *Amphiscii*, who are those which inhabit the *Torrid Zone*, or live between the Equator and Tropicks, and consequently have the Sun twice a Year in their Zenith; at which time they are *Ascii*, i. e. have no Shadows, the Sun being Vertical to them. These have their Shadows cast to the Southward, when the Sun is in the Northern Signs; and to the Northward, when the Sun is in the Southern Signs, reckoned in respect of them.

2. *Heteroscii*, who are those whose Shadows fall but one way; as is the Case of all such as live between the Tropick and Polar Circles: For their Shadows at Noon are always to the Northward in North Latitude, and to the Southward in South Latitude.

3. *Periscii*, are such Persons that inhabit those Places of the Earth that lie between the Polar Circles and the Poles, and therefore have their Shadows falling all manner of ways, because the Sun at some times of the Year goes clear round about them.

The Inhabitants of the Earth, in respect of one another, are also divided into three Sorts.

1. *Periaci*, who are such as inhabiting the same Parallel (not a *Great Circle*) are yet directly opposite to one another, the one being East or West from the other exactly 180 Degrees, which is their Difference of Longitude: Now these have the same Latitude and Length of Days and Nights, but exactly at contrary Times; for when the Sun Riseteth to one, it Sets to the other.

2. *Anteci*, who are Inhabitants of such Places, as being under a Semicircle of the same Meridian, do lie at equal Distances from the Equator, one towards the North, and the other towards the South.

Now these have the same Degree of Latitude, but towards contrary Parts, the one North, and the other South; and therefore must have the Seasons of the Year directly at contrary Times one to the other.

3. *Antipodes*, who are such as dwell under the same Meridian, but in two opposite and equidistant Parallels, and in the two opposite Points of those two Parallels; so that they go Feet against Feet, and are distant from each other an entire Diameter of the Earth, or 180 Degrees of a Great Circle.

These have the same Degree of Latitude, but the one South, the other North, and accounted from the Equator a quite contrary way; and therefore these will have all Things, as Day and Night, Summer and Winter, directly contrary to one another.

PROBLEMS.

I. To find the Latitude of any Place.

Bring the Place to the Brafs Meridian, and the Degrees of that Circle, intercepted between the Place and the Equinoctial, are the Latitude of that Place either North or South.

Then to fit the Globe so that the *Wooden Horizon* shall represent the Horizon of that Place, elevate the Pole as many Degrees above the *Wooden Horizon*, as are the Latitude of that Place, and it is done; for then will that Place be in the Zenith.

If after this you rectify the Globe to any particular Time, you may by the Index know the Time of Sun-rising and Setting with the Inhabitants of that Place, and consequently the present Length of their Day and Night, &c.

PROBLEM II.

To find the Longitude of Places.

Bring the Places severally to the Brafs Meridian and then the Number of Degrees of the *Equinoctial*, which are between the Meridians of each Place, are their Difference of Longitude either East or West.

But if you reckon it from any Place where a *First Meridian* is supposed to be placed, you must bring that *First Meridian* to the Brazen one on the Globe; and then turning the Globe about, till the other Place come thither also, reckon the Number of Degrees of the *Equinoctial*, intercepted between that *First Meridian*, and the proper one of the Place, and that is the Longitude of that Place, either East or West.

PROBLEM III.

For the Distances of Places on the Terrestrial Globe.

See the *Problem* on the Celestial Globe; *For finding the Distance between two Stars.*

PROBLEM IV.

To find what Places of the Earth the Sun is Vertical to at any time assigned.

Bring the Sun's Place, found in the Ecliptick on the Terrestrial Globe, to the Brazen Meridian, and note what Degree of the Meridian it cuts; then by turning the Globe round about, you will see what Places of the Earth are in that Parallel of Declination, (for they will all come successively to that Degree of the Brazen Meridian) and those are the Places or Parts of the Earth to which the Sun will be Vertical that Day; whose Inhabitants will then be *Asii*; that is, their erect Bodies at Noon will cast no Shadow.

Problems on the Celestial Globe.

Suppose *May* the 10th, 1701, the Sun's Place to be just at the Entrance into the first Degree of *Gemini*.

PROBLEM I.

To rectify the Globe: Or, To render it in the General fit to resolve any Problem; which Rectification therefore is always supposed to be the first thing done: To do which,

Bring the Sun's Place, found in the Ecliptick on the Globe, to the *Meridian*, and the Hour-Index to 12 at Noon.

PROBLEM II.

For the Sun's Declination.

Bring the Sun's Place for that Day, (which here and below is supposed to be given) to the *Meridian* as before, and then the Degrees of the *Meridian*, reckoned from the Equinoctial either North or South, are the Sun's Declination at Noon; either North or South, according to the Time of the Year, *viz.* from *March* the 10th to *September* the 12th, North; and thence to *March* again South: And the Declination for *May* the 10th will be 20 Degrees and about 12 Minutes North.

PROBLEM III.

For his Amplitude either Rising or Setting.

Bring the Sun's Place to the *Horizon*, either on the East or West Side, and the Degrees of the *Horizon*, accounted from the East Point, either North or South, are the Amplitude required; *viz.* *May* the 10th, the Sun's Amplitude will be 34 Degrees to the North of the East.

And at the same Time you have in the outer Circle of Rhombs the Point which the Sun Rises or Sets upon, N.E. by E. or N.W. by W.

PROBLEM IV.

For his Right Ascension.

Bring the Sun's Place to the *Meridian*, and the Number of Degrees intercepted between the beginning of *Aries*, and that Degree of the Equinoctial, which comes to the *Meridian* with the Sun, is the *Right Ascension*.

If you would have it in Time, account every 15 Degrees to be an Hour, and every Degree to be 4 Minutes.

N.B. The Reason of bringing the Sun's Place to the *Meridian* in this Problem, is to save the Trouble of putting the Globe into the Position of a *Right Sphere*: For properly *Right Ascension* is that Degree of the Equinoctial which Rises with the Sun, in a *Right Sphere*. But since the Equator is always at Right Angles to the *Meridian*, if you bring the Sun's Place thither, it must in the Equinoctial cut his *Right Ascension*: Thus in the Instance of *May* the 10th, the Sun's *Right Ascension* will be 59 Degrees, or 4 Hours wanting 4 Minutes.

PROBLEM V.

For the Oblique Ascension.

Bring the Sun's Place to the *Horizon* on the East-side, and the Number of Degrees intercepted between that Degree of the Equinoctial which is now come to the *Horizon*, and the beginning or first Point of *Aries* is the *Oblique Ascension*. Thus, *May* the 10th, the Sun's *Oblique Ascension* is 30 Degrees 15 Minutes.

Of those two *Ascensions* take the Lesser from the Greater, the Remainder will be,

PROBLEM VI.

The Ascensional Difference.

Which therefore is the Difference in Degrees between the *Right* or *Oblique Ascension*, or the Space between the Sun's Rising and Setting, and the Hour of Six: Wherefore his *Ascensional Difference* turned into Time, will give the Time of the Sun's Rising or Setting before or after Six. Thus, from 59 Degrees take 30 Degrees 15 Minutes, there will remain 28 Degrees 45 Minutes, the *Ascensional Difference* in Degrees, and in Time 1 Hour 55 Minutes; and so much doth the Sun Rise before Six, and Set after it.

PROBLEM VII.

For the Sun's Rising or Setting.

Bring his Place to the *Horizon*, either East or West, and the Hour-Index shall shew the Time either of his Rising or Setting accordingly; which, *May* 10th, is 5 Minutes after 4 in the Morning, and and 5 Minutes before 8 at Night.

The Time of the Sun's Setting doubled, gives the Length of the Day, which then will be 15 Hours 50 Minutes; and the Time of this Rising doubled, gives the Length of the Night; which, *May* 10th, is 8 Hours 10 Minutes.

PROBLEM VIII.

For the Sun's Meridian Altitude, or Depression at Midnight.

Bring his Place to the *Meridian*, above the *Horizon*, for his Noon Altitude, which will shew the Degrees of it accounted there from the *Horizon*; which, *May* the 10th, will be 58 Degrees 42 Minutes. For his Midnight Depression, below the North Point of the *Horizon*, you must bring the Point in the Ecliptick, opposite to the Sun's present Place, to the South Part of the *Meridian* above the *Horizon*; and the Degrees there intercepted between that Point and the *Horizon*, are his Midnight Depression;

Depression; which, *May* the 10th, will be 18 Degrees 42 Minutes.

PROBLEM IX.

For the Sun's Altitude at any Time of the Day given.

Rectify the Globe, and fit the Quadrant of Altitude; that is, screw the Brass Quadrant of Altitude to the Zenith; or in our Latitude, screw it so that the graduated Edge cut 51 Degrees 30 Minutes on the Meridian, reckoned from the Equinoctial.

Then turn about the Globe till the Index shew the Time proposed, and stay the Globe there; after which bring the Quadrant of Altitude to cut the Sun's Place in the Ecliptick, and then that Place or Degree of the Ecliptick shall shew the Sun's Altitude on the Quadrant.

Thus, *May* the 10th, the Sun's Altitude at Nine a Clock in the Morning will be 43 Degrees 30 Minutes.

PROBLEM X.

To find the Sun's Hour or Altitude when he is due East or West above the Horizon.

Rectify the Globe, and fit the Quadrant of the Altitude; then bring the Quadrant to cut the true East Point, and next turn the Globe about till the Sun's Place in the Ecliptick cut the graduated Edge of the Quadrant; for then that Place will shew the Altitude and the Index of the Hour.

Thus, *May* the 10th, the Sun will be East at 5 Minutes past Seven in the Morning, and his Altitude then is 26 Degrees.

PROBLEM XI.

To find the Sun's Altitude or Time of the Day on any Azimuth given: Or, When the Sun is on any given Point of the Compass.

Set the Quadrant of Altitude to the Azimuth given, then turn the Globe till his Place in the Ecliptick touch the graduated Edge of the Quadrant; so shall that Place give the Altitude on the Quadrant, and the Hour-Index the Time of the Day.

Example.

May the 10th, the Azimuth being 60 Degrees from the South toward the East, or the Point of the Compass which the Sun is then on, being S. E. by E. and near half a Point more Easterly; his Altitude will be (nearly) 46 Degrees, and the Hour of the Day a little more than a Quarter past Nine in the Morning.

PROBLEM XII.

To find the Declination and Right Ascension of any Star.

Bring the Star to the Meridian, and then the Degrees intercepted between the Equinoctial and the Point of the Meridian cut by the Star, are its Declination; and the Meridian curs and shews its Right Ascension on the Equinoctial, accounting it from the beginning of *Aries*.

PROBLEM XIII.

To find the Longitude and Latitude of any Star.

Bring the Solstitial Colure to the Brass Meridian, and there fix the Globe; then will the Pole of the Ecliptick be juſt under 23 Degrees 30 Minutes, accounted from the Pole above the North Point of the Horizon, and upon the ſame Meridian; there ſcrew the Quadrant of Altitude, and then bring its graduated Edge to the Star assigned, and there ſtay it; ſo will the Star cut its proper Latitude on the Quadrant, reckoned from the Ecliptick; and the Quadrant will cut the Ecliptick in the Star's Longitude, or its Diſtance from the firſt Point of *Aries*.

PROBLEM XIV.

To find the Time of any Star's Riſing, Setting, or Culminating, i. e. being on the Meridian.

Rectify the Globe and Hour Index, and bring the Star to the Eaſt or Weſt Part of the Horizon, or to the Brazen Meridian, and the Index will ſhew accordingly the Time of the Star's Riſing, Setting, or Culminating, or of its being on the Meridian.

Thus, *May* the 10th, *Arcturus* will be on the Meridian at about $\frac{1}{2}$ of an Hour after 10 at Night; *Cor Leonis* will be Setting about one in the Morning; and the firſt Star in the Head of *Aries* will be Riſing about an Hour after.

PROBLEM XV.

To know, at any Time assigned, what Stars are Riſing or Setting; what are on the Meridian, and how high they are above the Horizon; and on what Azimuth or Point of the Compaſs they are; by which means the real Stars in the Heaven may eaſily be known by their proper Names, and rightly diſtinguiſhed one from another.

Rectify the Globe, and fit the Quadrant of Altitude, and ſet the Globe, by the Means of the Compaſs, due North and South; then turn the Globe and Hour-Index to the Hour of the Night assigned; ſo will the Globe, thus fix'd, repreſent the Face or Appearance of the Heavens for that Time.

Whereby you may readily ſee what Stars are in or near the Horizon; what are on or near the Meridian; which are to the North, or which to the South, &c. And the Quadrant of Altitude being laid over any particular Star, will ſhew its Altitude and Azimuth, and on what Point of the Compaſs it is; whereby any Star may eaſily be known, eſpecially if you have a Quadrant, or any ſuch Inſtrument, to take the Altitude of any real Star ſuppoſed to be known by the Globe, to ſee whether it agree with that Star which is its Representative on the Globe or not.

PROBLEM XVI.

Given the Sun's Place, and any Star's Altitude, to find the Hour of the Night.

Rectify the Globe and fit the Quadrant, then move the Globe to and fro till the Quadrant cut the Star in its given Altitude, for then the Hour-Index will ſhew the Hour of the Night: And thus may

the Hour of the Night be known by a Star's Azimuth, or its Azimuth from its Altitude.

Example.

May the 10th, the Sun being in the first Degree of *Gemini*, I take the Altitude of *Lucida Lyra*; which I find to be 51 Degrees, or I find its Azimuth to be two Degrees to the Northward of the East; then bringing the Quadrant of the Altitude to cut that Star in 51 Degrees of Altitude, I find the Hour-Index points at Eleven a Clock at Night; as it would also have done had the Star been brought to the Azimuth on the Globe.

PROBLEM XVII.

To find the Distance between any Two Stars.

If the Stars lie both under the same Meridian, bring them to the Brazen Meridian, and the Degrees between them there reckoned are their true Distance.

Thus *Capella*, or the Star in the Left Shoulder of *Auriga*, and *Rigel*, which is in *Orion's* Left Thigh, are nearly under the same Meridian; and being both brought to the Brazen Meridian of the Globe, their Distance there will be found to be 54 Degrees.

If they are both in the Equinoctial, or have both the same Declination, *i. e.* are both in the same Parallel, then bring them one after another to the Brazen Meridian, and the Degrees of the Equinoctial intercepted between them, when thus brought to the Meridian severally, are their Distance.

If the Stars are neither under the same Meridian, nor parallel, then either lay the Quadrant of Altitude from one to the other, (if it will reach) and that will shew the Distance between them in Degrees; or else take the Distance with Compasses, and apply that to the Equinoctial, or to the Meridian.

Which Method of Proceeding also will shew the Distance of any Two Places on the Terrestrial Globe in Degrees; and by Multiplication by 70, you will have it in Miles. Wherefore to find how far any Place on the Globe is from another, you need only take the Distance between them on the Globe with a pair of Compasses; and applying the Compasses to the Equator at the beginning of *Aries*, or at the first Meridian, you will there find the Degrees; which multiply by 70, and that will turn it into Miles.

Thus the Distance between *London* and *Jamaica* being on the Globe 69 Degrees, I multiply that by 70, and it gives me 4830 Miles; and so far is *Jamaica* distant directly from *London*, or in an Arch of a Great Circle.

GLOBULUS Nafi, is the lower cartilaginous moveable Part of the Nose.

GLOSSOCOMIUM, is a Chyrurgeon's Instrument for broken Limbs; so called from the Shape of a Merchant's little Casket, which was formerly carried upon the Back. *Blanchard*.

GLOTTIS, is the Chink of the *Larynx*, which is covered by the *Epiglottis*.

GLUTÆI, are Six Muscles which move the Buttocks, on each Side three.

GLUTÆUS Major, a Muscle of the Thigh, so called from its being the largest Muscle of those which compose the Buttocks: It has a large Semi-circular Beginning, forwards merely Tendinous from near two Thirds of the External Parts of the

Spine of the *Os Ilium*; backwards its Origination is thick and fleshy from the posterior Part of the Spine, and hindmost part of the *Sacrum* laterally, and the whole *Os Coccygis*; as also from a broad Ligament that's extended between the two last named Bones and the Tubercle of the *Os Ischium*; its Fleishy Fibres descending digregately, in an almost Semi-circular manner, become Tendinous as they approach the great *Trochanter*, where it's united with its first described Tendinous Beginning, descending over the External Part of the great *Trochanter*, and after being joined with the Tendon of the *Membranosus*, proceeds to cover and strictly embrace all the External Muscles of the *Tibia*, like as the External Tendon doth of the *Biceps* of those of the *Cubiti*: But the other part of it proceeding from the Fleishy Body of this Muscle, is largely inferted to the *Linea Aspera*, on the back Part of the *Os Femoris*, near four Finger's Breadth below the great *Trochanter*.

The first described Tendinous Beginning of this Muscle doth not only serve to support its Fleishy Body, but its Fibres intersecting those of the *Membranosus*, as they cover all the Muscles of the *Tibia*, do more adequately include them, whereby they are corroborated in their Action: When this Muscle acts, it pulls the Thigh directly backwards.

GLUTÆUS Medius, a Muscle of the Thigh, which lies chiefly under the Tendinous Beginning of the *Glutæus Major*, and arising Fleishy from almost the whole External Part of the *Os Ilium*, in its descent becomes thicker and fleshy, and is inferted by a short strong Tendon to the Superior and External Part of the great *Trochanter* in a Semi-circular Manner. Mr. *Cowper* thinks this Muscle is employed to turn the Thigh inwards, though others say it serves to extend it.

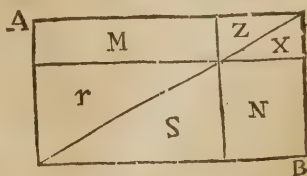
GLUTÆUS Minor, is a Muscle of the Thigh, which lies totally under the *Glutæus Medius*, it being so much less than that, as that is than the *Glutæus Major*. It ariseth Semi-circular, Broad, and Fleishy from the *Dorsus Ilij*; from hence its Fleishy Eibres descend to their partly Tendinous and partly Fleishy Infertion, like the *Medius*, at the Superior Part of the Root of the great *Trochanter*.

The Fibres of this running Parallel with those of the *Medius*, assist it in all its Actions: They also assist in rendering the Articulation of the Thigh-bone, with the *Coxa*, more stable in standing erect.

GLUTIA, are Two Prominences of the Brain, called *Nates*.

GLUTOS is the greater *Rotator* (an *Apophysis*) in the upper Part of the Thigh-bone, named *Trochanter*. *Blanchard*.

GNOMON, in a Parallelogram, is a Figure made of the two Complements, together with either of the Parallelograms about the Diagonal.



Thus here, in the Parallelogram *AB*, the *Gnomon* is $M + z + x + N$, or $M + r + s + N$.

GNOMON, in *Dialling*, signifies the *Style*, *Pin*, or *Cock* of a Dial, the Shadow whereof pointeth out the Hours.

The *Gnomon* of every *Dial* is supposed to represent the *Axis of the World*; and therefore the two Ends or Extremities thereof must directly answer to the North and South Pole.

GNOMONICKS, the same with *Dialling*.

GOARING; the Seamen say a Sail is cut *Goaring*, when 'tis cut sloping by degrees, and is broader at the *Clew* than at the *Earing*, as all *Top-sails* and *Top-gallant Sails* are.



GOBONATED, a Term in Heraldry for a Bordure of this Form; which is neither *Checky*, nor *Counter-compounded*, but of a different Division from both.

GOLDEN-NUMBER: See *Cycle of the Moon*.

To find the Golden-Number.

To the Year add 1, and divide the Sum by 19, the Remainder is the *Golden-Number*.

Example.

To 1701 add 1, the Sum 1702 divide by 19, the Remainder 11 is the *Golden-Number* for that Year.

GOLDEN-RULE: See *Rule of Three*.

GOLDEN Sulphur of Antimony, is made by boiling the Dross, arising in the making of *Regulus of Antimony*, in a little more than its Weight of common Water, in an Earthen Pot for about half an Hour, and then straining the Liquor, there is Vinegar poured upon it, on which a Reddish or Gold-colour Powder will precipitate: It must be gathered by Filtration and dried; 'tis an Emetick; the Dose from 2 to 6 Grains.

GOMPHOS, is when the Pupil of the Eye, going beyond a little Skin of the *Tunica Uvea*, is like that Swelling of hard Flesh in the Corner of the Eye called *Clavus*. *Blanchard*.

GOMPHOSIS, or *Conclavatio*, is when one Bone is fastened into another like a Nail, as may be seen in the Teeth. *Blanchard*.

GO NARGA, the Gout in the Knee.

GOOD-A-BEARING, or *Good-behaviour*, in Common Law, signifies an exact Carriage or Behaviour of a Subject to the King and his Liege-people, whereunto Men upon their evil Course of Life, or loose Demeanor, are sometimes bound: He that is bound to this, is more strictly bound than to the Peace; for the Peace is not broken without an Affray, but this Surety, *de bono gestu*, may be forfeited by the Number of a Man's Company, or by his or their Weapons or Harnes.

GOOSE-WING: When a Ship fails before a Wind, or with a Quarter Wind, and in a fresh Gale, the Seamen sometimes, to make the more haste, do *unparal* the Mizen-yard, and then they launch out both Sail and Yard over the Quarter on the Lee-side, fitting Guyes at the further End, to keep the Yards steady with a *Boom*, and this booms out the Mizen-sheet, and all this they do to give the Ship the more way, which otherwise, with these Winds, the Mizen-fail could not do, and this Sail so fitted is called a *Goose-wing*, and sometimes a *studding Sail*.

GORGE, *Gulla*, or *Neck*, in Architecture, is the narrowest part of the *Tuscan* or *Doric* Cap-

itals, lying between the *Astragal* above the Shaft of the Pillar and the *Annulets*. It is also a kind of Concave Moulding, larger, but not so deep as a *Scotia*, which serves for Compartments, Chambers, &c.

GORGE, in Fortification, is the Entrance of the Platform of any Work.

GORGE, in all other Out-Works, is the Interval betwixt their Wings on the Side of the great Ditch: But it ought to be observed, that all the *Gorges* are destitute of *Parapets*, because if there were any, the Besiegers having taken Possession of a Work, might make use thereof, to defend themselves from the Shot of the Place; so that they are only fortified with *Palisados* to prevent a Surprise.

GORGE of a Bastion, is nothing else but the prolonging of the *Curtains* from their Angle with *Flank* to the Center of the *Bastion* where they meet: But when the Bastion is flat, its *Gorge* is a right Line which terminates the Distance comprehended between two Flanks.

GORGE of the Ravelin, or of a *Half-Moon*, is the Space contained between the Extremities of the two Faces on the Side of the Place.

GORGED, the Herald's Term for the Bearing of Crown, Coronet, or such like thing about the Neck of a Lion or a Swan, &c. for then they say the Lion or Cygnet is *Gorged* with a Ducal Coronet, &c.

GOTHICK, in Architecture, is an Order so far different from the Ancient Proportions and Ornaments, that its Columns are either too massy in a Form of vast Pillars, or as slender as Poles, having Capitals without any certain Dimensions, carved with the Leaves of *Brank-Ursin*, *Thistles*, *Coleworts*, &c.

GRACILIS, is one of the Muscles of the Legs, so called from being the most slender of them: It ariseth somewhat broad, partly Tendinous and partly Flethy from the *Os Pubis* internally, between the first and second described Heads of the *Triceps*, and in its streight Descent in the Inside of the Thigh grows narrow, and becomes Tendinous a little above the *Sartorius*, and is so inserted (immediately beneath it) to the *Tibia*. It assisteth in bending the Thigh and Leg inwards.

GRAMINEOUS Herbs, amongst the Botanists, are such as have a long narrow Leaf, and no Foot-stalk.

These Bishop *Wilkins* (in his *Real Character*) ranges into such as are either,

1. *Fruentaceous*, i.e. whose Seed is used by Men for Food, either Bread, Drink, or Broth; such as Wheat, Rye, Barley, &c. Or,

2. Not *Fruentaceous*, more properly called Grasses, which have an hollow-jointed Stalk not branched, and a Stameneous Flower: See *Gramina* and *Grasses*. The *Fruentaceous Herbs* are sometimes called *Cercoles*.

GRAMMAR, is the Art of Speaking and Writing any Language truly. It takes its Name from the Greek Word *Gramma*, which signifies a Letter, because it treateth primarily of the Formation of Articulate Sounds, which are represented by Letters.

GRANADO, is a little hollow Globe or Ball of Iron, or other Metal, about two Inches and a half in Diameter, which being filled with fine Powder, is set on fire by the means of a small Fusee fastened to the Touch-hole; as soon as it is kindled, the Case flies into many Shatters, much to the Damage of all that

that stand near. These *Granadoes* serve to fire close and narrow Passages, and are often thrown with the Hand among the Soldiers to disorder their Ranks, more especially in those Posts where they stand thickest; as in *Trenches, Redoubts, Lodgments, &c.*

GRAND-ASSIZE: See *Assize*.

GRAND-CAPE: See *Cape* and *Attachment*.

GRAND-CLIMACTERICKS: See *Climacterical Year*.

GRAND-DISTRESS, is so called, because of the Quality and Extent thereof; for thereby the Sheriff is commanded, *Quod distringat tenentem, ita quod nec ipse nec aliquis per ipsum ad eam animum ap- paret, donec habuerit aliud preceptum, & quod de exitibus eorundem nobis respondeat, & quod habeat corpus ejus, &c.*

This Writ lies in two Cases, either when the Tenant or Defendant is Attached, and so return'd, and appears not, but makes Default; then a *Grand-Distress* is to be awarded: Or else when the Tenant or Defendant hath once appeared, and after makes Default, then this Writ lies by the Common Law in lieu of a *Petit-Cape*.

GRANIVOROUS, are those Animals that feed upon Corn and other Seed.

GRANT, in Law, signifies a Gift in Writing of such a thing as cannot aptly be passed or conveyed by Word only, as Rents, Reversions, Services, Advowsons in Gross, Common in Gross, Tythes, &c. Or made by such Persons as cannot give but by Deed, as the King and all Bodies Politick: Which Difference is often in Speech neglected, and then it is taken generally for every Gift whatsoever, made of any thing by any Person; and he that *granteth* is named *Grantor*, and he to whom it is made, the *Grantee*. A thing is said to lie in *Grant*, which cannot be assigned without Deed, 3 *Rep.* 63.

GRANULATION, in Chymistry, signifies pouring a melted Metal Drop by Drop into cold Water, that so it may *granulate* or congeal into small Grains. The best way is to pour the Metal through an Iron-Cullender, or through a new Birchen Broom.

GRAPHOIDES, a long, sharp, and slender Appendix of the Temple-Bones, somewhat bow'd like a Cock's-Spur: Also the Muscle called *Digastricus*.

GRAPHOIDES, is a Process like the Pen for a Table-book; about the Basis of the Brain it inclines backward.

GRAPNEL, is a kind of Anchor for Boats or Gallies to ride by: They differ from other Anchors, in that they have four Flukes and no Shack, though there are some with three Flukes, with which they use to sweep for Hawkers or small Cables: In Men of War also these Grapnels, or at least a lighter kind of them, are used to be thrown into an Enemy's Ship, in order to catch hold of some of her Gratings, Rails, Gunwales, &c. this is done in order to boarding of her.

GRATINGS, in a Ship, are small Ledges of sawed Plank framed one into another like a Lattice or Prison-grate, lying on the Upper-Deck between the Main-mast and Fore-mast, serving for a Defence in a close Fight; and also for the Coolness, Light and Contrivance of the Ship's Company.

There is also another Grating in the Head of a Ship, where the Necessary-House stands.

GRAVE-ACCENT, in Grammar, shews when the Voice is to be depress'd, and is express'd thus, ()

GRAVEDO, the same with *Corryza*.

GRAVELLED-ASHES, are the Lees of Wine dried and burn'd to Ashes: So that they are a kind of Calcined Tartar.

GRAVING of a Ship, is bringing her first a-ground, and then burning off (with Reeds, Broom, &c.) all the Filth and Foulness that sticks to her Sides without-board, in order to pay her anew.

GRAVITAS *Acceleratrix*: See *Vis Centripeta*.

GRAVITY, or as it may be called, the *Vis Centripeta*, is that Quality by which all Heavy Bodies tend towards the Center of the Earth, accelerating the Motion as they come nearer towards it. And this Admirable and Universal Law of Nature is that which (generally speaking) keeps all Bodies in those Places and Stations which they are designed for.

About the Cause of this great and Catholick Affection of Matter, there have been various Sentiments.

1. *Aristotle* will have all Earthy Bodies, by a Natural Inclination, to tend towards the Center of the Earth, as to their proper Place, *Sub Concava Luna*: But it hath been proved over and over, that there is no such thing as *Positive* or *Absolute Gravity* or *Levity*.

2. *Copernicus* asserts Gravity to be an Innate Principle in all the Parts of Matter, when they are by any Means separated from their Wholes, to reduce themselves thither again the nearest way, or in Right Lines. But this is not to assign any Physical Cause of this great Effect, but only to say Bodies descend, because they are heavy, or because they descend.

They also that explain Gravity by *Universal Attraction*, do only give us another Word, but no Idea of the Cause of Gravity.

3. *Gassendus* and *Kepler*, and many others, define Gravity to be a Motion impressed on all Bodies by a certain Magnetic Attraction of the Earth or Globe, to which any Body descends.

These will have the Earth to be one great Magnet or Loadstone, continually sending out Magnetical Effluvia, which lay hold on all Bodies, and draw them towards the Earth: See *Gilbert* and *Kircher de Magnete*.

4. *Des Cartes* supposes the Particles of his Celestial Matter, by being reflected from the Surface of the Earth, and consequently ascending up again, from thence to drive down into their Places the Terrestrial Bodies which they find above them, *See* 20, 21, 22, 23. of his *Principia Philosoph.*

But 'tis very difficult to conceive, and, I think, implies a kind of Contradiction, that Bodies should be forced downwards by a continual Impulse of other Matter tending upwards, and acting upon all Parts uniformly and equally.

The Ingenious Mathematician Mr. *Keil* of *Batol-College, Oxon*, hath also sufficiently overthrowed this Hypothesis in the Preface to his *Introductio ad Veram Physicam*.

5. *Vossius*, and some others, will needs have the Diurnal Motion of the Earth round its Axis to be the Cause of the Descent of heavy Bodies: Whereas 'tis demonstrable, from Experiment and the Doctrine of the Laws of Motion, That the Reverse of Gravity would thence ensue: For all Bodies moving circularly, do always endeavour to recede *ab Axe Motus*; and all loose Bodies would then be cast off from the Earth in a Tangent to the Parallel Latitude of any Place.

6. Others mistaking the Effect for the Cause, will have the Pressure of the Atmosphere to occasion Gravity, or the Descent of heavy Bodies: But 'tis plain by Experiments made in *Vacuo*, That the Atmosphere, like all other Fluids, doth hinder the Descent of heavy Bodies, rather than further them or cause them; for a Feather in *Vacuo* will descend as fast as a Bullet or Stone in the open Air.

7. The Learned Dr. Hook, in his *Micrographia*, P. 22. seems to think, that by supposing our Globe of Earth, Air, and Water, environ'd round with a Fluid very subtle and heterogeneous to them all, and which can freely pervade the Pores, not only of Glasses, but even of the closest Metals; the Endeavour of this Fluid to intrude all Earthly Bodies from it, may, by that and some other Properties, make all Bodies move towards the Center of the Earth: And he saith he can prove, by many Experiments, that there is such a Fluid. But this Opinion appears to be Defective on the same Account that the *Cartesian* is; which see.

8. The Learned Mathematician Capt. Edmund Halley, owns Gravity to be an Effect unsolvable by any Philosophical Hypothesis; and Modestly and Religiously resolves it into the immediate Will of our All-wise Creator, who by appointing this Law throughout all the Material World, keeps all Bodies in their proper Places and Stations, which, without it, would soon fall to Pieces and be utterly destroyed. *Philosoph. Transact. N. 197.*

Sir Isaac Newton, Book 2. Prop. 19. Corol. 5. observes very well, That of all Bodies confidered within the Confines of any Fluid, there is a twofold Gravity, the one *True* and *Absolute*, the other *Apparent*, and *Vulgar*, and *Comparative*.

Absolute Gravity, is the whole Force by which any Body tends downwards; but the *Relative* or *Vulgar* is the Excess of Gravity in any Body above the Specific Gravity of the Fluid, whereby it tends downwards more than the Ambient Fluid doth.

In reference to *Absolute Gravity*, the Parts of all Fluids and all Bodies do really gravitate in their proper Places, and therefore by their joint Weights do make the Weight of the Whole: For every heavy Whole is an Heavy Body, as we find by Experience in Vessels filled with all Kinds of Liquors; and the Weight of any Whole is equal to, because compounded of, the Weight of all its Parts.

The latter Kind of Gravity is such, that in reference to it, Bodies do not gravitate in their Places, or rather do not, when compared one with another, *pre-gravitate*; but by hindring one another in their mutual Endeavour to descend, do remain in their proper Places all one as if they were not heavy at all. Those Things which do not *pre-gravitate* in the Air, Water, &c. the Vulgar take to have no Gravity; and only judge those to be heavy Bodies which they see *pre-gravitate* or descend, because they cannot be supported by the ordinary Gravitation of the Fluid, or by its Pressure all manner of ways.

So that the Notion of Weight among the Vulgar, is only the Excess of any Bodies Weight above that of Air: And consequently they account those things to be *Light*, which being less heavy than Air, are supported by it, or buoyed up in it.

Whereas these *Comparatively* light Bodies are not so *really*, since in *Vacuo* it hath been found by Experiment, that they descend as fast as other heavy Bodies do in the Air, (Vid. Mr. Boyle's Experiments of his Air Pump.)

The Properties of Gravity are very well enumerated by Capt. Halley, in Numb. 179. of Philosophical Transactions.

1. That by it all Bodies descend towards a Point, which either is, or is very near to the Center of Magnitude of the Earth and Sea; about which the Sea forms it self into a Spherical Surface, and the Prominences of the Land, considering the Bulk of the Whole, differ but insensibly therefrom.

2. That this Point or Center is fixed within the Earth, or at least hath been so ever since we have any Authentick History: For a Consequence of its Shifting, though never so little, would be the overflowing of the Low-Lands on that Side the Globe towards which it approached.

And this he thinks would well account for the Universal Deluge, To have the Center of Gravitation to be removed for a Time towards the Middle of the then inhabited World.

And he saith, That a Change of its Place but the 2000th Part of the Radius of our Earth, would be sufficient to lay the Tops of the highest Hills under Water.

3. That in all Places equi-distant from the Center of the Earth, the Force of Gravity is nearly equal.

But indeed all Places on the Earth's Surface are not at equal Distances from the Center; because, as Sir Isaac Newton hath proved, the Equatorial Parts are something higher than the Polar Parts; the Difference between the Earth's Diameter and Axis being about 34 English Miles, which hath been confirmed by the Necessity of making a Pendulum shorter (in those Places) before they will swing Seconds.

4. Gravity equally affects all Bodies, without regard either to their Bulk, Figure, or Matter: So that abstracting from the Resistance of the Medium, the most Compact and Loose, the Greatest and Smallest Bodies would descend equal Spaces in equal Times, as appears from the quick Descent of very light Bodies in the exhausted Receiver. Whence a very great Difference may be observed betwixt Gravity and Magnetism; the latter affecting only Iron, and that towards its Poles; the former all Bodies alike in every Part.

Hence also may be concluded there is no such Thing as positive Levity, those Things which appear light being only comparatively so. And whereas several Things rise and swim in Fluids, 'tis only because they are not, bulk for bulk, so heavy as those Fluids: Nor is there any Reason why Cork for Instance, should be said to be light, because it swims on Water, any more than Iron, because it will swim on Mercury.

5. That this Power increases as you descend, and decreases as you ascend from the Center of the Earth; and that in Proportion of the Squares of the Distances therefrom reciprocally: So, as for Instance, at a double Distance to have but a Quarter of the Force, &c. which is highly agreeable to Reason,

son, because the gravitating or attracting Power must needs be exerted more vigorously in a small Sphere, and more feebly in a greater, in Proportion, as it is contracted or expanded. Wherefore seeing the Surfaces of Spheres are to one another, as the Squares of their Radij, their Power at several Distances will be as the Squares of those Distances reciprocally; and then its whole Action upon each Spherical Surface, be it great or small, will be always equal.

Mr. *Hugens*, in the last Proposition of his Fourth Part of his Book *De Horologio Oscillatorio*, shews by Experiments most accurately made, That Gravity is that Force by which a Body, placed any where near the Surface of the Earth, is impelled towards the Center after the Rate of $15\frac{1}{12}$ of Paris Feet in a Second of Time.

The very Learned and Ingenious Capt. *Halley*, in his Discourse about the Cause of Springs in *Philos. Transact. N. 192.* seems to think, That there may be some Matter which may have a *Conatus* directly contrary to that of Gravity; as is, saith he, the Case in Vegetation, where the Sprouts tend directly upwards, or against the Perpendicular.

GRAVITY of Bodies, is either *Specifick* or *Absolute*: See *Specifick Gravity*.

GREAT-HEAR: See *Urfa Major*.

GREAT CIRCLES of the Globe or Sphere, are those whose Plane passing thro' the Center of the Sphere, divides it into two equal Parts or Hemispheres; of which there are Six drawn on the Globe, viz. the *Meridian*, *Horizon*, *Equator*, *Ecliptick*, and the two *Colures*; which see.

GREEN-CLOTH, or *Counting-House* of the King's Household, is so called, because the Table stands always covered with a *Green-Cloth*: Here sit the Lord-Steward, Treasurer of the King's House, Comptroller, Master of the Household, Cofferer, two Clerks of the *Green-Cloth*, and two Clerks Comptrollers, for Daily taking the Accounts of all Expences of the Household, making Provisions and ordering Payment for the same, for the good Government of the King's Servants, and paying the Wages of those below Stairs.

GREEN-WAX, in Law, signifies the Estreats of Fines, Issues, and Amerciaments in the Exchequer, under the Seal of that Court made in *Green-Wax*, to be levied in the County: See *Foreign Apposer*.

GREGORIAN-YEAR, *The New Account*, or, *New Stile*, instituted upon the Reformation of the Calendar by Pope Gregory XIII. (from whom it takes the Name) in the Year 1582; whereby Ten Days being taken out of the Month of *October*, the Days of their Months go always Ten Days before ours: As for Instance, their Eleventh is our First Day: Which *New Stile*, or *Account* is used in most Parts beyond the Seas; and is called from Pope Gregory, the *Gregorian Account*.

GRENADO: See *Grenado-Shell*.

GRIPE of a Ship, is the *Compass* or Sharpness of her Stem under Water, and chiefly towards the Bottom of the Stem: And the Design of shaping her so, is to make her Gripe the more, or keep a good Wind; for which end sometimes a False Stem is put on upon the true one.

GRIPE also is the Sea Phrase for a Ship's being apt to run her Head or Nose too much into the Wind, for then they say *She Gripes*. And there are two Causes of this Effect; either over-loading a

Ship a-head, the Weight of which presses her Head so down, that it is not apt to fall off from the Wind; or else the *Staying* or *Setting* her Masts too much aft, which will always be Fault in a short Ship that draws much Water, and will cause her to be continually running into the Wind: But in *Floaty Ships*, if the Masts be not stayed very far aft, they will never keep a good Wind.

GROMETS, in a Ship, are small Rings fastened to the upper Side of the Yard of a Ship, by Staples, to tie unto it, or to fasten the *Laskets*.

GROUND-TACKLE, is the Sea Term for a Ship's Anchor, Cables, &c. in general; or whatever is necessary to make her ride safe at Anchor in proper Ground.

GROUND-TIMBERS, in a Ship, are those Timbers which lie on her Keel, and are fastened to it with Bolts through the Keelson. They are so called, because the Ship lies at rest upon them when she is a-Ground.

GROUNDING of a Ship, is bringing of her on Ground to be trimmed, made clean, scrubbed, or have some Leak stopp'd in her.

GRY, according to Mr. *Lock*, is a Measure containing $\frac{1}{10}$ of a Line: A Line is $\frac{1}{10}$ of an Inch, an Inch $\frac{1}{10}$ of a Philosophical Foot, and a Philosophical Foot is $\frac{1}{2}$ of a Pendulum, whose *Diadromes* or *Vibrations*, in the Latitude of 45 Degrees, are each equal to one Second of Time, or $\frac{2}{3}$ of a Minute.

GRYPHUS, a sort of crooked Pincers used by Surgeons.

GUARDANT, the Term in Heraldry for a Lion born in a Coat of Arms, when his Face is turned towards the Spectator, and he appears in a Posture of Guard or Defence (as it were) of himself.

GUARD-COCK: See *Gardecout*.

GUDGIONS, in a Ship, are the Eyes drove into the Stern Post, into which the Pintles of the Rudder go, to hang her on.

GUEST-ROPE, is that Rope by which the Boat is kept from *Steering*, or going too much in and out, as she lies in the Tow of a Ship.

GULA or Gullet: See *Oesophagus*.

GULBE, in Architecture, the same with *Gorge*.

GULES, so the Heralds call the Red Colour in the Arms of Gentlemen; but in those of the Nobility they call it *Ruby*; and in Sovereign Princes Coats *Mars*. 'Tis expressed in Engraving by perpendicular Strokes or Hatches, thus,



GULF, in Geography, is a Part of the Ocean or Great Sea, which runs up into the Land thro' narrow Passages, which are called *Streights*; as the *Gulf of Florida* in America, the *Arabian Gulf* or *Red-Sea* in Africa, the *Persian Gulf* in Asia, and the *Gulf of Venice*, or the *Adriatick Sea* in Europe.

GUMMA Gallicum, is by some the Term for the eating out of a Bone in the *French Pox*.

GUNTER'S-LINE, is the common Line of Numbers, invented first by Mr. *Gunter*, and so commonly known that there is no need of a Description of it here; it being not only done by the Inventor in his Book of the Sector, but also by *Everard*, *Brown*, *Partridge*, in their Sliding Rules, and almost every one that hath written of Practical Mathematics. See Vol. II.

GUNTER'S-QUADRANT, is an Instrument made in Wood or Brass, curiously contrived to find the Hour of the Day and Azimuth, with most Propositions of the Globe; as also Heights and Distances.

You have a full Description of it in Mr. *Gunter's* Book of the Sector; but 'tis by no means so good to find the Hour of the Day as Mr. *Collins's* Quadrant: See *Quadrant*.

GUNTER'S-SCALE, called by the Common Seamen usually, *The Gunter*, is a large plain Scale, with the Lines of Artificial Sines and Tangents fitted so to a Line of Numbers, that they can by the Compasses work all Questions in plain Dialling, &c. with tolerable Exactness, if the Scale be large and good. It hath its Name for being the Invention of the above-named Mr. *Gunter*, and is now commonly put on all our Scales, and on our Sectors, where they are usually called, *The Artificial Lines*.

GUNWALE, or *Gunnel* of a Ship, is that Piece of Timber which reaches on either side of the Ship from the Half-Deck to the Fore-castle, being the uppermost *Bend* which finisheth the upper Works of the Hull in that Part, and wherein they put the Stanchions which support the Waite-Trees; and this is called the *Gunwale*, whether there be Guns in the Ship or no: And the lower Part of any *Port*, where any Ordnance are, is also termed the *Gunwal*.

GURGULIO, the same with *Gion*, or the *Epi-glottis*; which see.

GUTTA Rosacea, is a Redness with Pimples, wherewith the Cheeks, Nose, and whole Face is deformed, as if it were sprinkled with red Drops: These Pimples or Wheals often increase to that degree, that they render the Face rough and horrid, and the Nose monstrously big.

GUTTA-SERENA, or *Amaurosis*, is a Dimness, or even total Loss of the Sight, caused by a Watery Humour flowing down from the Brain upon the Optick Nerves.

GUTTÆ, or *Drops*, in Architecture are certain Parts in Form of little Bells, which, to the Number of Six, are put below every *Triglyph* in the *Architrave* of the *Dorick* Order. They are so called by Architects from their Shape, representing the Drops of Water, which having run along the *Triglyphs*, still hang under the Closure between the Pillars.

GUTTAL-CARTILAGE, in Anatomy, is that which includes the third and fourth Gristle of the *Larynx*, which seem to be but one, by reason of the common Membrane with which they are covered.

GUTTE de l'Eau, Drops of Water; these in Heraldry they paint Argent or White.

GUTTE de Larmes, when they are Drops of Tears, and these in Heraldry are painted Blue or Azure.

GUTTE de Or, Drops of melted Gold; all which kinds are sometimes born in Escutcheons,

GUTTE de Sang, the Term in Heraldry for Drops of Blood born any how in a Coat of Arms; if the Drops are of any other Substance, they are called accordingly.

GUTTORIŌ Or, the same that is called *Hyoides Or*.

GUVE de Ronde, a Term in Fortification, signifying the same as a simple or a *single Tenaille*: See *Tenaille*.

GUY; a *Guy* in a Ship, is any Rope used to keep off things from bearing or falling against the Ship Side when they are to be hoisted in: Thus, if any thing is to be haled in over the Gunwale, it is gently eased in by a *Guy-Rope* fastened usually to the Stanchions of the Waite-Trees.

That Rope also which is made fast to the Fore-mast at one End, and is reeved thro' a single Block seized to the Pendant of the Winding-Tackle, and then again reeved through another seized to the Fore-mast, and whose Use is to hale forward the Pendant of the Winding-Tackle, is also called a *Guy*.

GYMNASTICKS, that Part of Physick which treats of the Rules that are to be observed in all sorts of Exercises, in order to the Preservation of Health. This is said to be invented by one *Herodicus*, born at *Selymbra* a City of *Thrace*, or, as some say, at *Leutimi* in *Sicily*; He was Brother to *Georgius* the Famous Rhetorician and Philosopher.

This *Herodicus* was at first Master of an Academy, where young Gentlemen came to learn Warlike and Manly Exercises; and whom he observing to be very Healthful on that Account, he made *Exercise* become an Art, in reference to the Recovery of Men out of Diseases, as well as, preserving them from them, and called it *Gymnastick*, which he made a great Part of his Practice of Physick: But *Hippocrates*, who was his Scholar, blames him sometimes for his *Excesses* in this kind of Physick, and his want of Judgment in prescribing this Method of Cure in Fevers, &c. And *Plato*, in his *Phædr.* exclaims against him with great warmth on this Account, and saith, he used to enjoin his Patients to walk from *Athens* to *Megara*, (which is about 25 Miles) and to come home again on Foot as they went, as soon as ever they had once but touch'd the Walls of the City.

GYNÆCIA, in general, are the Accidents incident to Women; but *Hippocrates* takes them more strictly for the Courses. *Blanchard*.

GYNÆCOMASTUM, is the growing of the Breasts. *Blanchard*.

GYRON, an Ordinary in Heraldry, consisting of two straight Lines issuing from divers Parts of the Escutcheon, and meeting in the Fesse Point; thus,

He beareth *Sanguine* a Gyron issuing from the Dexter Point Or.



HABEAS *Corpora*, is a Writ that lies for the bringing in a Jury, or so many of them as refuse to come upon the *Venire facias*, for the Trial of a Cause brought to issue.

HABEAS Corpus, is a Writ which a Man Indicted for a Trespass before Justices of Peace, or in a Court of any Franchise, and being apprehended and imprisoned for the same, may have out of the King's Bench, to remove himself thither at his own Costs, and to answer the Cause there.

And the Order of this Case is, first to procure a *Certiorari* out of the Chancery, directed to the said Justices for the removing of the Indictment into the King's Bench; and upon that, to procure this Writ to the Sheriff, for the causing of his Body to be brought at a Day.

HABENDUM, is a Word of Form in a Deed or Conveyance, every of which must have two Parts, *viz.* the *Premises*, and the *Habendum*.

The Office of the *Premises* is to express the Names of the Grantor, Grantee, and the Thing granted.

The Office of the *Habendum* is to limit the Estate so, that the general Implication of the Estate, which (by Construction of Law) passeth into the *Premises*, is by the *Habendum* controlled and qualified.

HABERE facias Seisinam, is a Writ Judicial, which lieth where a Man hath recovered Lands in the King's Court, directed to the Sheriff, and commanding him to give *Seisin* of the Land recovered. This Writ is sometimes issuing out of the Records of a Fine, executory, directed to the Sheriff of the County where the Land lieth, and commanding him to give the Cognisee, or his Heirs, *Seisin* of the Land whereof the Fine is levied, which Writ lieth within the Year after the Fine or Judgment, upon a *Scire facias*, and may be made in divers Forms.

There is also a Writ called *Habere facias Seisinam, ubi Rex habuit annum, diem, & vasum*; which lies for the Delivery of Land to the Lord of the Fee, after the King has taken his Due of Lands of him that was convicted of Felony.

HABERE facias visum, is a Writ that lies in divers Cases, where view is to be taken of the Lands or Tenements in question.

HABITUDE, is a Disposition of the Mind or Body, acquir'd by reiterated or repeated Acts; as Skill and Knowledge in the Sciences, Virtue, Vice, Excellence in Painting, Writing, Dancing, &c.

HAEMOLYSIS, according to some, is a reflected Inversion of the Eye-lid.

HEMALOPS, the Extravasation of Blood about the Eye, occasion'd by a Blow or Contusion, commonly called a *Blue Eye*: Also the Redness of the Eyes proceeding from an Inflammation, or the Distention of the Blood-Vessels in the Eye, or that which we call a *Blood-shotten Eye*.

HEMATOSIS, the same with *Sanguification*; it is performed in all the Parts of the Body, and not in any peculiar Part, as the Heart, Liver, Spleen, as some formerly imagined: See *Blood*.

HEMODIA, a painful Numness of the Teeth, proceeding from the Irritation of the Membranes

that surround their Roots, or of the Nerves that are dispersed through their Substance. 'Tis usually occasioned by the eating of Acid Fruits, or the Vomiting of Acid Humours: We commonly say in *English*, that the Teeth are set on Edge.

HEMOPTYSIS, is the spitting of Blood from the Lungs, which proceeds either from a sweating out at the Glandules of the *Larynx*, with which its *Tunick* is clothed within; to wit, when the Openings of the Arteries are too much relaxed; or from some great Vessels that are broke, or out of the little Bladders of the Lungs themselves. *Blanchard*.

HEMORHAGIA, is a Flux of Blood at the Nostrils, Mouth, or Eyes, &c.

HEMORRHOIDES, are Swelling Inflammations in the *Rectum*, or about the Fundament, red and painful, which sometimes send forth Blood or Matter. *Blanchard*.

HEMORRHOIDICAL-VEINS, are either *Internal* or *External*.

The *Internal* are Branches of the third and last Division of the *Vena Mesenterica*, which is it self the right Branch of the *Porta*: This is spread thro' the Middle of the *Mesenterium*, and goes to that Part of the *Colon* which lies on the Left Side to the *Rectum*, and thence down to the *Anus*.

The *External Hemorrhoidal-Veins* arise from the *Vena Hypogastrica*, and sometimes from a double Branch of it spreading about the *Sphincter* of the *Anus*; and this Hypogastrick-Vein is, in it self, Part of the Internal Branch of the *Vena Iliaca*.

HÆREDE Abducto, is a Writ that lieth for a Lord, who having the Wardship of his Tenant under Age, by Right cannot come by his Body, for that he is conveyed away by another.

HÆREDE deliberando alii qui habet custodiam terre, is a Writ directed to the Sheriff, willing him to command one, having the Body of him that is Ward to another, to deliver him to him, whole Ward he was by reason of his Lord.

HÆRETARE, in Law, signifies to give a Right of Inheritance, or make the Donation Hereditary to the Grantee and his Heirs.

HÆRETICO Comburendo, is a Writ that lies against him that is a Heretick; *viz.* that having once been convicted of *Heresy* by his Bishop, and having abjured it, afterwards falling into it again, or into some other, is thereupon committed to the Secular Power. Sir *Edward Coke*, in his 12th Report, Fol. 93. is of Opinion, that this Writ lies not at this Day.

HAILE; to *haile* a Ship, is either to call to her to know from whence she is, and whither she is bound; or else to salute her, and wish her Health.

HALE; to *hale* a Ship, is the same thing as what we call *pulling a-shore*.

HALF-MOON, in Fortification, is an Out-work that hath only two Faces, forming together a Salient-Angle, which is flanked by some Part of the Place, and of the other Bastions.

These *Half Moons* are sometimes raised before the Curtain, when the Ditch is a little wider than it ought to be; in which Sense 'tis much the same with a Ravelin, only the Gorge of an *Half-Moon* is

is made bending in like a Bow or Crescent; and is most times used to cover the Point of a Bastion; whereas Ravelins are placed before the Curtain; but they are Defective, as being ill Flanked.

HALLIARDS, in a Ship, are those Ropes by which they hoist up all her Yards. The Cross-jack and the Sprit-sail Yard indeed have no *Halliards*, because they are always flung; tho' in small Craft, or Vessels, they have *Halliards* to the Sprit-sail Yard.

HALO, or *Halos*, is a certain Meteor in Form of a bright Circle or Ring that surrounds the Sun, Moon, or Star, but more especially the Moon.

These *Halos* or Crowns do sometimes appear colour'd like the Rainbow: And our Incomparable Sir Isaac Newton gives a Hint of the Solution of this Phenomenon in his Opticks, *Pag. III.* shewing that it arises from the Sun or Moon's shining thro' a thin Cloud, consisting of Globules of Hail or Water all of the same Size. And he gives you two Observations of his own, of the actual Appearance of colour'd *Halos*'s; one about the Sun, *June 1692*; the other round the Moon, *Febr. 19. 1694*, at Night.

HALO, is a reddish Spot or Circle of Flesh which surrounds each Nipple in the Breasts of Women.

HANDSPIKE, is a Wooden Leaver, with which, at Sea, they *Traverse* the Ordnance, or heave withal in a *Windlass* to weigh up the Anchor.

HARIOT, or *Heriot*, in Law, is taken for the best Cattle that a Tenant hath at the Hour of his Death, due to the Lord by Custom. And there is *Harriot Service* and *Harriot Custom*. *Harriot Service* is after the Death of a Tenant in Fee-simple; and *Harriot Custom* is after the Death of a Tenant for Life. Also *Harriot Service* is often express'd in the Grant of a Man, that he holds by such Service to pay *Harriot* at the Time of his Death, that holdeth in Fee-simple. *Harriot Custom* is when *Harriots* have been paid Time out of Mind by Custom, and this may be after the Death of a Tenant for Life: And for this the Lord may distrain and seize; but of right, neither the Lord nor Officer should take *Harriot*, before it be presented at the next Court holden after the Tenant is dead, that such a Beast is due for a *Harriot*. If the Lord purchase Part of the Tenancy, *Harriot Service* is extinguish'd; but it is not so in *Harriot Custom*. And if the Lord ought to have a *Harriot* when his Tenant dieth, and the Tenant deviseth away all the Goods, yet the Lord shall have the *Harriot*, for the Law preferreth the Custom before the Devise.

HARMONIE, is, in some Authors, an Anatomical Term, and signifies the same with *Mendosa Sutura*, viz. a jointing together the Bones of the Head, particularly those of the Nose and Palate, by a freight Line.

HARMONICAL Proportion, or *Musical*, is when, of four Numbers, As the First: Is to the Fourth :: So is the Difference of the First and Second: To the Difference of the Third and Fourth.

As 5 : 8 : 12 : 30, are *Musical Proportionals*, because 5 : 30 :: 8 - 5 : 30 - 12 :: 3 : 18.

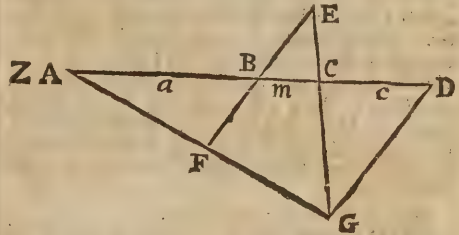
Suppose in *Species* the four Terms *A, M, N, E*, let it be, *A : E :: M - A : E - N*.

Wherefore *AE - AN = ME - AE*. These Terms being rightly ordered, 'twill be $\frac{AN}{2A - M}$

$= E$; and $\frac{EM}{2E - N} = A$.

In Words thus:

If the Rectangle, contained under the first and third Terms, be divided by the Excess of twice the first above the second; the Quotient will be the fourth Term in *Harmonical* or *Musical Proportion*: Wherefore it is necessary the Terms should be so given, that the double of the first may exceed the second.



A Right Line, as *AD*, is said to be divided *Harmonically*, if being cut into 3 Parts, *AB, BC*, and *CD*, the Case be so, that as the Whole *AD* (or *ZD*) is to either Extream *a* or *c* :: so shall the other Extream be : to the indeterminate Part *m*. That is,

$$\begin{array}{l} Z : a :: c : m \\ Z : c :: a : m \end{array} \quad \text{Wherefore } Zm = ac.$$

And to divide any given Right Line thus *harmonically*, as suppose *AD*;

From either End of it draw a Right Line, as *DG*, making an Angle with it, and of any Length: Connect the End of this Line with the other End *A*, by drawing *AG*; and then taking any Point, as *B*, at pleasure, in the given Line there draw *EF* parallel to *DG*, and in it take *BE* equal to *BF*; then draw *EG*, and that shall find the Point *C* required; and then calling, as above, the whole Line *Z : AB = a : BC = m*, and *CD = c*: I say *Z : a :: c : m*.

For the Triangles *ADG, ABF*, and *BEC* are all similar; and consequently *AD : AB :: DG : BF*; or as *DG : to BF = BE*; but as *DG : BE :: CD : BC*; (by working about the equal Angles *D* and *BEC*.) Wherefore, by Equality, *AD : AB :: CD : CB*; that is, *Z : a :: c : m. Q.E.D.*

And from hence 'tis plain, That the Ratio of the whole Line *AD* to the Segment *B*, may be taken at pleasure: But that the intermediate Part *BC*, must be less than either *AB* or *CD*.

HARMONY, is an agreeable or pleasing Union between two or more Sounds, continuing together at the same time.

Harmony is naturally produced by *Consonances*, but Art has discover'd the way to make it yet more agreeable, by the Mixture of *Dissonances*.

HARPINGS, in a Ship, is properly her Breadth at the Bow; tho' some call the Ends of the *Bentis*, which are fastened into the Stem, by the same Name.

HATCHES of a Ship, are the Doors in the Midship, or between the Main-mast and Fore-mast, by which any Goods of Bulk are let down into the Hold. Hence the

HATCH-WAY, is that Place which is directly over the Hatches; so that to lay a thing into the *Hatch-way*, is to put it so that the Hatches cannot be come at, or opened.

The Heat of the Sun for any small Portion of Time, is always as a Rectangle, contain'd under the Sine of the Angle of Incidence of the Ray producing Heat at that Time.

The Excellent Sir *Isaac Newton*, at the End of his Opticks, just now publish'd, renders it probable, tho' he proposes it but as a Query; That Flame is a Fume, Vapour, or Exhalation heated red hot; that is, so hot as to shine: Because Bodies don't flame without emitting a copious Fume, and this Fume burns in the Flame.

The *Ignis Fatuus*, is a Vapour shining without Heat, and there seems to be the same difference between the Vapour and Flame, as between rotten Wood shining without Heat, and burning Coals of Fire. In distilling hot or ardent Spirits, if the Head of the Still be taken off, the ascending Vapour will take Fire at the Flame of a Candle, and be turn'd into Flame; and the Flame will run along the Vapour from the Candle to the Still.

Some Bodies heated by Motion or Fermentation, if the Heat grow intense, fume copiously; and if the Heat be great enough, the Fumes will shine and become Flame: Metals in Fusion usually don't Flame for want of a copious Sulphur; except Spelter, which Fumes copiously, and thereby flames.

All Flaming Bodies, as Old Tallow, Wax, Wood, Fossil-Coals, Pitch, Sulphur, &c. by Flaming waste and vanish into burning Smoke; which Smoke, if the Flame be put out, is very thick and visible, and sometimes smells strongly, but in the Flame loses its Smell by Burning; and according to the Nature of the Smoke, the Flame is of several Colours, as that of Sulphur is Blue, that of Copper open'd with Sublimate, Green, that of Tallow, Yellow, &c. Smoke passing through Flame cannot but grow red hot, and red hot Smoke can have no other appearance but that of Flame.

As great Bodies probably conserve their Heat the longest, so the Reason of it seems to be, That their Parts heat one another: Whence *great dense*, and *fix'd Bodies*, when heated beyond such a Degree, may emit Light so copiously, as by the Emission and Reaction of its Light, and the Reflections and Reactions of its Rays within its Pores to grow still hotter, till it come to such a Period of Heat, as is that of the Sun: Wherefore we may suppose the Sun and fix'd Stars to be great Earths vehemently hot, whose Heat is conserved by the Greatness of the Bodies, and the mutual Action and Reaction between them and the Light which they emit; and whose Parts are kept from fuming away, not only by their Fixity, but also by the vast Weight and Density of the Atmospheres incumbent upon them, and very strongly pressing them, and condensing the Vapours which arise from them. See Vol. II.

HEAVE, at Sea, signifies to throw away, or to fling any thing over-board, this they call, *Heaving it over-board*; also, turning about the Captain, is called, *Heaving at the Captain*; likewise when a Ship being at Anchor, riseth and falleth by the force of the Waves, she is said, *To Heave and Set*.

HEAULME, (or as they write it, *Heawme*) is the Herald's Term for an Helmet, or Head-piece.

HEAVY Bodies Descent: See *Descent of heavy Bodies*.

HEBRAISM, is the proper Idiom of the Hebrew Tongue.

HECTICA, is a Continued Fever, arising from the very Habit of the Body, and introduced in a long Time, and has so rooted it self into the very Constitution, that it is very difficult ever to cure

it: For the most part it is accompanied with an Ulcer of the Lungs, Leanness, and a Cough. *Blanchard*.

HEEL; that part of the Foot of any Mast which is pared away flanting on the aftward side of the Foot, in order that the Mast may be *stayed after-ward on*, the Seamen call the *Heel of the Mast*; but the *Heels of the Top-masts* are Squares, and in that they put the Fid of the Top-mast.

Also if a Ship lie on one side, whether she be *a-ground* or *a-float*, they say *She Heels offward*, or to the Shore, *a-starboard*, or *a-port*.

HEGEMONICA, are the Principal Actions in a Humane Body, as the Actions Animal and Vital. *Blanchard*.

HEGIRA, a Term in Chronology, signifying the *Epocha*, or Account of Time used by the *Arabians* and *Turks*, who begin their Computation from the Day that *Mahomet* was forced to make his Escape from the City of *Mecca*, which happen'd on *Friday, July 16. A.D. 622.* under the Reign of the Emperor *Heracleus*.

HEIGHT of a Figure, is the Perpendicular Line drawn from the Top to the Base (sometimes produced) either within the Figure or without it.

HEIGHT of the Pole: See *Altitude of the Pole*.

HEIR, a Word having not altogether the same Signification with *Civilians*; who call *Heredem*, *qui ex testamento succedit in universum jus Testatoris*; as in Common Law, which calls him *Heir* that succeeds by Right of Blood in any Man's Lands or Tenements in Fee; for by the Common Law nothing passeth *Jure Hereditatis*, but only Fee: Moveables, or Chattels immovable, are given by Testament to whom the Testator listeth, or else are at the Disposition of the Ordinary, to be distributed as he in Conscience thinketh meet. Every *Heir*, having Lands by Descent, is bound by the binding Acts of his Ancestors, if he be named, *Qui sentit commodum, sentire debet et onus*.

HELICYDRA, are certain little Ulcers, thick and red; and in the Skin of the Head, like the Nipples of the Breasts, which send forth Matter. *Blanchard*.

HELIACAL-RISING, is when a Star, having been under the Sun's Beams, gets from the same so as to be seen again.

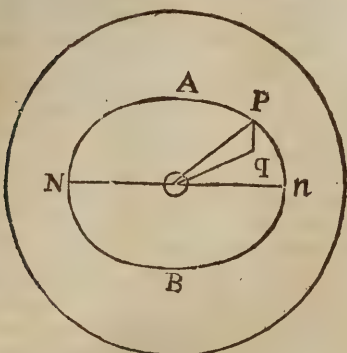
HELIACAL-SETTING, is when a Star, by the near Approach of the Sun, first becomes inconspicuous; this is reckon'd in the Moon but at 17 Degrees distance, or thereabouts; but in other Stars, 'tis as soon as they get distant, or come near the Sun by the Space of a whole Sign.

HELICE Major and Minor, the same with *Ursa Major and Minor*.

HELICOSOPHY, is the Art of Delineating all sorts of *Spiral Lines in Plano*.

HELIOCENTRICK Place of a Planet, is said to be such, as it would appear to us from the Sun, if our Eye were fix'd in its Center.

Heliocentrick Latitude of a Planet.



If the outer Circle represent the Orbit of the Earth round the Sun, and then the inner one be placed so as to be inclined to the Plane of the other (for which reason it appears in the form of an Ellipsis) when the Planet is in *N* or *n* (which Points are call'd its *Nodes*) it will appear in the Ecliptick, and so have no *Latitude*; but if it move to *P*, then being seen by the Sun, it will appear to decline from the Ecliptick, or to have *Latitude*, and the Inclination of the Line $\odot P$ to the Plane of the Ecliptick, is called the Planet's *Heliocentrick Latitude*, and the Measure of it is the Angle $P \odot q$, supposing the Line Pq to be perpendicular to the Plane of the Ecliptick: And this Heliocentrick Latitude will be continually increasing till it come to the Point *A*, which they call the *Limit* or utmost Extent of it, and then it will decrease again till it come to nothing in *N*; after which it will increase again till it come to *B*; and lastly, be decreasing again till the Planet come to be in *n*, &c.

HELIOSCOPES, are a sort of Telescopes fitted so as to look on the Body of the Sun without Offence to the Eyes.

Of these Dr. Hook hath written a little Tract, and proposes, that by inserting 4. Reflecting Glasses into a Telescope, the Sun's Rays shall come to the Eye, but with $\frac{1}{257}$ part of their usual Strength. And this Way the Doctor prefers to all others.

But without any such long Apparatus, Mr. Hagen's Way, of only using a Plane-Glass black'd at the Flame of a Lamp or Candle on one Side and placed between the Eye-Glass and the Eye, will answer the Design of an Helioscope very well: The Truth of which I have often found my self by Experience.

HELIX, is the Exterior Brim of the Ear, so called from its winding. The Interior is called *Scapha*.

HELIX, in Geometry, is the same with *Spiral*; which see.

HELLENISM, is the Imitation in *Latin*, or any other Language, of the proper Idiom of the Greek Tongue.

HELM, or Tiller of a Ship, is that Beam or Piece of Timber that is fastened into the Rudder, and so comes forward into the Steerage, where he that stands at Helm steers the Ship, by holding the Whip-staff in his Hand, a piece of Wood for that purpose, fastened into the *Helm*.

The Terms of Art belonging to the Helm, are,

1. Port the Helm: That is, Put the Helm over to the Left Side of the Ship.

2. Starboard the Helm; That is, Put it to the Right side of the Ship.

3. Right the Helm, or Helm a Mid-ship; that is, Keep it even with the Middle of the Ship.

Bear up the Helm; That is, Let the Ship go more large before the Wind.

5. Bear up round; That is, Let the Ship go directly before the Wind, in the Middle between her two Sheets.

HELM also, with the Chymists, is the Head of any Still or Alembick, because 'tis in Figure something like an Helmet, or Steel Cap, used by the Cavalry in War: So that to bring a thing over the Helm, is the same as to force it by Fire up to the Top of the Vessel, that it may distil down into the Receiver by the Nose or Beak of the Head; and when they say, That such a Thing cannot be brought over the Helm, they mean, 'tis of too fix'd a Nature to be raised into Vapour, or Salt, by the Force of Fire.

HELMINTHAGOGUES, or *Helminthicks*, are Medicines that expel Worms, or bring 'em away by Stool. *Blanchard*.

HELOS, or *Clavus*, is a round, white, callous Swelling of the Foot like the Head of a Nail, and fixed in the Roots of the hard Skin of the Foot. *Blanchard*.

HEMERALOPIA, or *Acies nocturna*, is when one sees better in the Night than in the Day. *Blanchard*.

HEMICRANIA, is a Head-ach in either Part of the Brain.

HEMPAGIA, the same that *Hemicrania*.

HEMIPLEGIA, is a Palsie on one Side below the Head, proceeding from an Obstruction in one part or other of the Spinal Marrow; or from a Blow; whence it comes to pass, that the Animal Spirits are obstructed in their Passage. *Blanchard*.

HEMIPLEXIA, the same with *Hemiplegia*.

HEMISPHERE, is the Half of a Globe or Sphere when 'tis supposed to be cut thro' the Center in the Plane of one of its greatest Circles. Thus the Equator divides the Terrestrial Globe into the Northern and Southern Hemisphere; and the Equinoctial, the Heavens after the same manner.

The Horizon also divides the Earth into 2 Hemispheres, the one Light, and the other Dark, according as the Sun is above or below that Circle.

Also Maps or Prints of the Heavens, Constellations, &c. pasted on Boards, are sometimes called *Hemispheres*, but usually *Planispheres*.

The Writers of *Opticks* prove, that a Glass Hemisphere unites the Parallel Rays at the Distance of a Diameter and one third of a Diameter from the Pole of a Glass. *Molyneux Dioptr. Nov. p. 94.*

HEMITRITEUS, an Irregular Intermitting Fever that returns every Day, but with this Difference from a Quotidian, that the Fit comes twice every other Day.

HENDECAGON, in Geometry, is a Figure that hath 11 Sides, and as many Angles.

Hendecagon, in Fortification, is taken for a Place defended by 11 Bastions.

HENIOCHUS, one of the Northern Constellations of fix'd Stars: See *Auriga*.

HEPAR, the Liver, is a Flethy large Viscus, placed in the Right Hypochondrium; its Convex and Upper-side reaches a little beyond the *Cartilago Xiphoides*, and touches the *Diaphragm*; its Concave and Under-side covers the *Pylorus*, and part of the Stomach, as also part of the *Colon*, all the *Duodenum*:

with a part of the *Jejunum*, and of the *Omentum*; and when we are standing, its lowest Extremity reaches near to the Navel.

Its Figure is almost round and pretty thick; its upper Convex-side being smooth and equal, but the lower Concave one by no means so. In its Middle and Fore-part it is divided into two, by a Fissure where the Umbilical Vessels enter. The Gall-Bladder is fastened to its Under-side, where are three Eminences that the Ancients called *Porta*, of which one passes for a little Lobe.

When it is full of Blood, it is of a dark red Colour; but when the Blood is wash'd out of it, it looks pale and feels soft.

It is fasten'd to the Body by two Ligaments:

The first, which is large and strong, comes from the *Peritonæum*, that covers the *Diaphragm*, and penetrating the Substance of the Liver, joins the *Capsule* of the *Porta*.

The second is the Umbilical Vein, it comes from the Navel, and enters by the great Fissure of the Liver to join the *Porta*: After the Birth it degenerates into a Ligament, but is of little Use for the fastening the Liver: 'Tis covered with a common Membrane from the *Peritonæum*, besides that every Lobe and Gland has its proper Membrane: The common Membrane of the Liver being raised, its Substance appears, which is composed of several Lobes of Glands, of a Conick Figure, not easily to be distinguish'd in the Liver of Men: These Lobes are dispos'd all along the Sides of each Branch of the Vessels in the Liver, they are every one cover'd with a proper Membrane, and ty'd to one another by other Membranes in such a manner, as that they leave also little Intervals betwixt them, which are more visible in Fish, and other imperfect Animals; every Lobe receives small Vessels, which are continu'd to the little Glands of which each Lobe is composed.

The Vessels of the Liver, are the *Vena Cava* and the *Porta*; they are accompanied with many small Branches of the Arteries, which come from the *Celiacæ* and *Mesentericæ Superior*, which two bring the Blood for the Nourishment of the Liver: The *Porta* brings the Blood full of Bile for Secretion, and the *Cava* carries back the Blood that remains from both: The *Vena Porta* and the *Cava* enter the Liver by its Concave-side, and are equally distributed through all its Substance: Where ever there is a Branch of the one, there is a Branch of the other; so that each Lobe, and each Gland in the Lobe, whether on the Convex, or on the Concave-side, receive the same Vessels.

The *Vena Porta* discharges by the Extremity of its Branches, the Blood, as yet full of Bile, into the little Glands which form the Lobes, of which the *Parenchyma* of the Liver is composed, where being separated from the Bile, which is taken up by the Biliary Vessels (which accompany the Branches of the *Porta*) and carried to the Gall-Bladder or *Duodenum*, it is carried back by the Branches of the *Cava*; it receives its Nerves from the *Plexus Hepaticus* of the Intercostal Nerve.

Besides these Vessels, the Liver has Lymphatick Vessels, most of which open into the conglobated Glands, near the *Porta*, on the Concave-side of the Liver, from thence the *Lympha* is carried, by other Lymphaticks, to the *Receptaculum Chyli*.

We come now to the Excretory Vessels of the Liver; which are, the *Vesicula Fellea*, and *Porus Biliaris*: The *Vesicula Fellea*, or Gall-Bladder, is fix'd to the Concave-side of the Liver; its Figure is like that of a Pear; 'tis of a different Bigness almost in

every Subject; the biggest is about the Bigness of a little Hen's Egg; when the Liver is in its natural Situation, the bottom or largest Part of the Bladder is downwards; and the Neck or narrowest Part upwards, and the Point touches the Stomach, as well as the *Colon*, where it frequently dyes them Yellow. This Bladder is compos'd of three Coats, the outermost is common to it with the Liver; the next which is proper to it, is thick and solid, compos'd of Transverse, Oblique, and Streight Fibres: The third is thin and nervous: This last Coat is cover'd within by a kind of Crust or Mucus, which preserves it against the Acrimony of the Bile: *Malthighius* has remarked some little Glands between its Coats, where the Cystick Arteries end; which gave him Ground to think that it was the same in the *Porus Biliaris*. The Bile is brought into the Gall-Bladder by some small Vessels which arise from the neighbouring Glands, and uniting, form one or two Pipes which open at the Neck of the Bladder: These Ducts I could never discover in any Liver, but an Ox's, though I have reason to think they are likewise in a Human. From the Neck of the Gall-Bladder there goes a Pipe, not in a streight Line with the Bladder, but as it were more depress'd in the Liver; it is called *Ductus Chylificus*; some small Biliary Ducts open likewise into it, and its inner Membrane has several *Ruga*, which retard the Motion of the Bile. To this Pipe (which is about the bigness of a Goose-Quill) is join'd another, called, *Ductus Hepaticus*, or *Porus Biliaris*; these two together make the *Ductus Communis Choledochus*, which goes obliquely to the lower end of the *Duodenum*, or the beginning of *Jejunum*: After it has pierc'd between the Coats, before it opens the Cavity of the Intestine; which oblique Insertion serves instead of a Valve, to hinder the Bile to return into *Ductus Communis*, having once enter'd the Intestine. The Gall-Bladder has two Veins from the *Porta*, which are called *Cystica Gemellæ*; it has some small Arteries from the *Celiacæ Dextra*, and some Lymphaticks.

The *Porus Biliaris* is another Excretory Vessel of the Liver; it has as many Branches as the *Vena Porta*, which it accompanies through every Lobe and Gland in the Liver; where ever there is a Branch of the one, there is a Branch of the other, and these two are enclosed in one common Capsule, as in a Sheath: The Use of this Capsule is to facilitate the Blood and Bile, by the Contraction of its Fibres. All these Branches unite, and make one Pipe of the Bigness of a small Quill, which joins, as we have said, at the end of the *Ductus Chylificus*, for the carrying the Bile from the Liver to the Intestines, by the *Ductus Communis Choledochus*.

The Insertion of the *Porus Biliaris* into the *Ductus Chylificus*, is Oblique, with its Mouth looking towards the *Ductus Communis*; by which means it is impossible that the Bile which comes from the *Cystica*, can enter the *Porus*.

The Bile which is found in the Gall-Bladder, is thinner, and different from that which is in the *Porus Biliaris*. This *Malthighius* proves by an Experiment; which is this, That having tied the *Ductus Chylificus*, he remarked, that the Bile which came by the *Porus Biliaris* was of a different Taste, Smell, Colour, and Consistency from that in the Gall-Bladder.

The Use of the Bile is to sheath or blunt the Acids of the Chyle; because they being entangled with its Sulphurs, thicken it so, as that it cannot be sufficiently diluted by the *Succus Pancreaticus* to enter the *Lactæal Vessels*; this appears not only from the

the Analysis of the Bile, which yields more of a Lixivious than of a Volatile Alkaline Salt; but likewise from what *Lubenboeck* has observed, That of the great quantity of Acid Salts he has seen amongst the Aliments of the Stomach, he never could find any in the Chyle, after it had passed the *Duodenum*.

Because some Chyle is almost always passing through the *Duodenum*, therefore it was necessary that the Bile likewise should be continually poured into it from the *Ductus Hepaticus*. In a Dog, whose *Ductus Communis Cholidochus*, was near as big as in a Man, I have gather'd it at the rate of 2 Drachms in an Hour; but because a great Quantity of Aliments requires a greater Quantity of Bile, therefore according as the Stomach is more or less defended with Food, it presses out of the Gall-Bladder a proportionable Quantity of Gall, to be mix'd with the Chyle in the Guts. *Dr. Keil.*

HEPATICK Medicines are, for the most part, such as are both *Diaphoretical* and *Diuretical*.

HEPATICA *Vena*, the same with *Basilica*.

HEPATICK *Aloes*, is the finest sort of Aloes, brought commonly from an Island in *Persia*, called *Succotra*, whence the Name *Aloes Succotrina*: 'Tis called *Hepatick*, because 'tis near the Colour of the Liver.

HEPATICUS *Morbus*, or *Hepatick Flux*, is a Dejection, of a watery sharp Blood, like the washing of Flesh, when the nervous Juice, or watery Blood, being not rightly concocted, but sharp, is discharged into the Guts: Also when black shining dried Blood is driven into the Guts. The Disease is so called, because they attributed Sanguification to the Liver. *Blanchard.*

HEPIALA: See *Epiala*.

HEPTAGON, in Geometry, is a Figure of several Sides and Angles; and is call'd a *Regular Heptagon*, if those Sides and Angles be equal.

HEPTAGON, in Fortification, is taken for a Place that hath 7 Bastions for its Defence.

HEPTANGULAR Figure, in Geometry, is that which consisteth of 7 Angles.

HEPTHEMIMERIS, is a *Cesura* in a *Latin Verse*, where after the third Foot there is an odd Syllable, which serves to help make a Foot with the next Word; as in this:

Ille latus niveum molli fultus hyacinto.

HERCULIUS *Morbus*, the same with *Epilepsia*.

HEREDITAMENTS, in Law, signifies all such Things immovable, be they corporeal, or incorporeal, as a Man may have to himself and his Heirs, by way of Inheritance; or not being otherwise bequeathed, do naturally and of course descend to him and his next Heir of Blood, and fall not within the Compaſs of an Executor or Administrator, as Chattels do. It is a Word of large extent, and much used in Conveyances; for by the Grant of *Hereditaments*, Houses, Seigniories, Mannors, Houſes and Lands of all Sorts, Charters, Rents, Services, Advowſons, Commissions, and whatever may be inherited, will paſs.

HERETICO *Comburendo*: See *Heretico Comburendo*.

HERISSON, in Fortification, is a Beam arm'd with a great Quantity of small Iron Spikes or Nails, having their Points outward, and is supported by a Pivot, upon which it turns, and ſerves inſtead of a Barrier to block up any Paſſage. They are frequently placed before the Gates, and more eſpecially the Wicket-Doors of a Town or Fortreſs, to ſecure thoſe Paſſages which muſt of Neceſſity be often open'd and ſhut.

HERMETICAL *Philosophy*, is that which pretends to ſolve and explain all the Phenomena of Nature, by the three Chymical Principles, Salt, Sulphur, and Mercury.

HERMETICAL *Physick*, is that Hypotheſis in the Medicinal Art, which refers the Cauſe of all Diſeaſes to Salt, Sulphur, and Mercury.

HERMETICAL *Seal*, or *Hermes's Seal*, or to Seal or Stop up any Glaſs *Hermetically*, is to heat the Neck of the Glaſs till 'tis juſt ready to melt; and then with a pair of hot Pincers to pinch or cloſe it together. This way are all *Thermometers* ſealed up, and the Chymiſts ſeal up thus a Liquor in a Matraſs, or Bolt-head, when they deſign it ſhould be long circulated in a gentle Heat.

HERMETICK *Art*, is the ſame with Chymiſtry: 'Tis ſo called from *Hermes*, or *Mercury*; whom the Chymiſts will needs aſſert to have been the firſt and moſt famous Chymiſt.

HERNIA, or *Ramex*, is properly the Falling of the Inteſtines, Cawl, &c. by the Proceſſes of the *Peritoneum* dilated into the Groin: Alſo a Protuberance of the Navel: The Falling down of the Womb is improperly ſo called; as alſo ſwelling in the *Larynx*; winding Tumours of the Spermatick Veſſels; Diſtenſions from Flatulent Matter; watery Humours, or Swellings: *Blanchard.*

HERPES, a ſpreading and winding Inflammation, is two-fold; either *Miliaris*, or *Pustularis*, like Millet-ſeed, which ſeizes the Skin only, and itches; or *Exedens*, conſuming; which not only ſeizes the Skin, but the Muſcles underneath: The Cauſe of it is, That the Glandules of the Skin are too much ſtuffed with Salt Particles, which are kept there by others that are viſcous, whence proceed the little Ulcers like Millet-ſeed, that occasion an itching in the Skin, which if the Peccant Humour abound, they grow into a Cruſt, and eat the Parts they lie upon. *Blanchard.*

HERSE, in Fortification, is a *Lattice*, or *Port-cullice*, made in the Form of a Harrow, and beſet with many Iron Spikes. It is uſually hung by a Cord faſten'd to a Moulinet, which is cut in caſe of Surprize, or when the firſt Gate is broken with a *Petard*, to the End that the *Herſe* may fall, and ſtop up the Paſſage of the Gate, or other Entrance of a Fortreſs. Theſe *Herſes* are alſo often laid in the Roads to incommode the March as well of the Horſe, as of the Infantry.

HERSILLON, in Fortification, is a Plank ſtuck with Iron Spikes, for the ſame Uſe as the *Herſe*.

HETEROCLITES, in Grammar, are ſuch Nouns as are of different Declenſions in one Number, from what they are in the other.

HETEROCRANIA, is a Pain in one Part or other of the Head.

HETEROGENEAL Nouns, in Grammar, are ſuch as have one Gender in the Singular Number, and another in the Plural, as *Tartarus*, *Tartara*; *Locus*, *Loca*, &c.

HETEROGENEAL Numbers, are mix'd Numbers conſiſting of Whole ones (or Integers) and of Fractions.

HETEROGENEAL Surds, are ſuch as have different Radical Signs; as

$$\sqrt[3]{aa} \text{ and } \sqrt[5]{bb} : \sqrt[5]{7} \text{, and } \sqrt[3]{19}.$$

How to reduce Surds to Homogeneal ones, ſee under *Surds*.

HETEROGENEAL Light, is by our admirable Sir *Iſaac Newton* ſaid to be that which conſiſts of Rays of differing Degrees of Refrangibility: This, the

the common Light of the Sun or Clouds is *Heterogeneous*, being a Mixture of all Sorts of Rays. See *Colours*.

HETEROGENEOUS Particles, are such as are of different Kinds, Natures, and Qualities, of which, generally, all Bodies are composed: And therefore, when in Chymistry a Body is analysed or dissolved by the Fire, or any *Menstruum*; if Parts or Principles of different Natures (such as Salt, Oil, Spirit, Water, and Earth) can be separated from it; those are called *Heterogeneities* (by *Helmont*) because they are all of very different Kinds or Natures from one another.

HETEROSCH, in Cosmography, are such Inhabitants of the Earth as have their Shadows falling but one way; as those who live between the Tropicks and Polar Circles, whose Shadows at Noon in North Latitude, are always to the Northward, and in South Latitude to the Southward.

HEXACHORD, a certain Interval of Musick or Concord, commonly called a *Sixth*; and is twofold, viz. the *Greater* and *Lesser*.

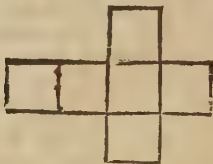
The *Greater Hexachord* is composed of two greater Tones, two lesser Tones, and one greater Semi-Tone, which are five Intervals: But the *Lesser Hexachord*, consists only of two Greater Tones, one Lesser Tone, and two Greater Semi-Tones.

The Proportion of the former, in Numbers, is as 3 to 5; and that of the other, as 5 to 8.

HEXAGON, in Geometry, is a Figure of six Sides and Angles; and if those Sides and Angles be equal, 'tis called a *Regular Hexagon*.

HEXAHEDRON, is the same with the Cube, being a Regular Solid of six equal Sides or Faces. See *Regular Bodies*.

The following Figure, being cut in Paste-board and folded up, will represent the *Hexahedron* or *Cube*.



HEXASTYLE, an Ancient Building which had six Columns in the Face before, and six also behind, and is the same with the *Pseudodipteron*.

HIDROA, are Pimples about the Secret Parts, proceeding from a sharp Humour. *Blanchard*.

HIDRONOSUS, is a Fever, wherein the Patient sweats extremely: The *English* call it the *Sweating-Sickness*. *Blanchard*.

HIDROTICK Medicines, are those that procure and promote Sweating: See *Sudorificks*.

HIPPEUS, or *Equinus*, a Comet that some Writers will needs have to resemble a Horse: But the Shape of this kind of Comet is not always alike, as being sometimes *Oval*, and sometimes imitating a *Rhomboides*.

Its Train, in like manner, is sometimes spread from the Front or Fore Part; and at other times from the Hinder Part: Therefore they are distinguished into *Equinus Barbatus*, *Equinus Quadrangularis*, and *Equinus Ellipticus*.

HIPPUS, is an Affection of the Eyes, wherein they continually shake and tremble, and now and then twinkle, as it happens in riding. *Blanchard*.

HIRCUS, *Hirci*, or *Hirqui*, the Corners of the Eyes: See *Cantibus*. *Blanchard*.

HIRCUS, a fixed Star; the same with *Capella*.

HIRCUS, a Name given by some Writers to a sort of a Comet encompassed by a kind of Main, seeming to be rough and hairy, by reason of its Rays appearing like Hairs: It is also sometimes without any Train or Bush.

HIRQUUS, the same with *Cantibus*.

HITCH, is a Sea Word, to catch hold of any Thing with a Hook or a Rope; and to hold it fast. Thus say they, when the Boat is to be hoisted in, *Hitch the Tackles into the Rings of the Boat*; so *Hitch the Fish-hook to the Fluke of the Anchor*, when they are about to weigh the Anchor.

HOISE: See *Hoyse*.

HOLD, of a Ship, is all that Part of it which lies between the Keelson and the Lower-Deck; wherein, divided by Bulk-heads, are the Steward's Room, the Powder-Room, the Bread-Room, and the Boat-swain's-Room; and in a Merchant-Man, the Goods or Lading in general.

HOLD-OFF, is a Term at Sea, used about heaving in the Cable at the Capstan: For if it be very stiff and great, or have lain long in a Slimy or Oazy Ground, unless that Part which is heaved in by, be haled away hard from the Capstan, the Cable will surge or slip back; therefore it must be haled away as fast as it comes in, that the Cable may keep close about the Whelps: And this Work is called *Holding-off*, and may be done by Hand with a small Cable; but in all great Ships they either *hold-off* with Nippers, or else bring the Cable also to the Jeer-Capitan.

HOLLOW-TOWER, in Fortification, is a Rounding made of the Remainder of two Bristures, to join the Curtain to the Orillon, where the Small-Shot are plaid, that they may not be so much exposed to the View of the Enemy. And the

HOLLOW-SQUARE, is a Body of Foot drawn up, with an empty Space in the Middle for the Colours, Drums, and Baggage, facing and covered by the Pikes every way to oppose the Horse.

HOMAGE, is the Submission, Promise, and Oath of Service and Loyalty which a Tenant makes to his Lord, when he is first admitted to his Land, which he holds of the Lord in Fee (tis probably derived from the Word *Homo*;) because the Form, as appointed by Stat. 17. Edw. 2. in these Words; When a Free-man shall do *Homage* to his Lord, of whom he holdeth in Chief, he shall hold his Hands together between the Hands of his Lord, and shall say thus;

I become your Man from this Day forth for my Life, for Member, and for Worldly Honour; and shall owe you my Faith for the Land I hold of you, saving the Faith that I owe unto our Sovereign Lord the King, and to mine other Lords.

And in this manner the Lord of the Fee, for which *Homage* is due, taketh *Homage* of every Tenant as he cometh to the Land or Fee.

HOMAGE is sometimes used for the Jury in a Court-Baron, where it consisteth most commonly of such as owe *Homage* unto the Lord of the Fee.

HOMAGE Ancestral, is where a Man and his Ancestors, time out of Mind, held their Land of their Lords and his Ancestors by *Homage*: And if such Lord have received *Homage*, he is bound to acquit the Tenant against all other Lords above him; of every manner of Service. And if the Te-

nant hath done *Homage* to his Lord, and is impleaded, and vouches the Lord to Warranty, the Lord is bound to warrant him; and if the Tenant lose, he shall recover in Value against the Lord so much of the Lands as he had at that time of the Voucher, or any time after.

HOMAGIO Respektuando, is a Writ directed to the Escheator, commanding him to deliver Seisin of Lands to the Heir that is full Age, notwithstanding his *Homage* not done, which ought to be performed before the Heir have Livery, or his Lands, except there fall out some reasonable Cause to hinder it.

HOMICIDE, in Common Law, signifies the Killing of a Man, and it is divided into *Voluntary* and *Casual*.

Homicide Voluntary, is that which is deliberate, and committed of a set Mind and Purpose to kill, and is either with a precedent Malice, or without: The former is Murder, and is a Felonious Killing, through Malice premeditated, of any Person living in this Realm under the King's Protection: See *Murder*, *Man-slaughter*, *Chance-medley*.

Homicide Casual, is either merely *Casual* or *mixt*.

Merely Casual, is when the Slayer kills a Man by pure Mischance, being about his lawful Occasions; as in the Case of an Axe slipping out of a Man's Hand, or falling off while he is felling a Tree.

But 'tis accounted *Mixt*, when there is Negligence, or some other unwarrantable Circumstance, seized with the Action.

HOMINE capto in Withernamium, is a Writ to take him that hath taken any Bond-man or Woman, and let him or her out of the Country, so that he or she cannot be replevied according to Law.

HOMINE eligendo ad custodiendam peciam sigilli pro mercatoribus editi, is a Writ directed to a Corporation, for the Choice of a new Man to keep the one Part of the Seal, appointed for *Statutes-Merchants*, when the other is Dead.

HOMINE replegiendo, is a Writ to bail a Man out of Prison: In what Case it lies, see the *New Book of Entries*.

HOMOCENTRICK, the same with *Concentrick*.

HOMOGENEAL, signifies of the same Kind or Sort, or that which differs not in Nature, &c. The same with *Homogeneous*.

HOMOGENEAL Numbers, are those of the same Nature and Kind: And

HOMOGENEAL Surds, are such as have one commo Radical Sign; As

$$\sqrt[3]{27}, \text{ and } \sqrt[3]{3}.$$

HOMOGENEOUS Particles, are such as are all of the same Kind, Nature, and Properties: As the Parts of pure Water, of mere Earth without Salt in it; or the Parts of the finer Metals, such as Gold, Silver, &c. 'Tis used in Opposition to *Heterogeneous*; which see.

HOMOGENEAL Light, is that whose Rays are all of one Colour and Degree of Refrangibility, without any Mixture of others: See *Colours*.

HOMOGENEUM Comparationis, so *Vieta* calls the *Absolute Number* in a Quadratick or Cubick, &c. Equation; and this Number always possesseth one Side of the Equation, and is the Product of the Roots multiplied one into another; therefore *Oughtred* expresses it by this Character *E*, because 'tis a Rectangle between the two Roots *A* and *E*. The Reason of the Name is, that all the Roots, which

being multiplied into one another, do produce the *Absolute Number*, must be Homogeneous one to another: See *Absolute Number*.

HOMOIOMERICAL Principles of Anaxagoras: This Ancient Philosopher supposed, that there were in all mixt Bodies, (such as Fleth, Fruits, &c.) determinate Numbers of such *Similar Principles*, as when they came to become Parts (*ex. gr.*) of an Animal Body, would there make such Masses and Combinations as their Nature required, *viz.* the *Sanguinary Particles* would then meet all together, and make *Blood*; the *Urinous Particles* would constitute *Urine*; the *Osseous* ones *Bones*; the *Carneous* ones *Flesh*, &c.

HOMOLOGOUS, in Geometry, signifies those Quantities which are alike to one another in *Reason*; as when we say, there is the same Reason of *A* to *B*, as of *C* to *D*: Here *A* is Homologous to *C*, as *B* to *D*, because of the Similitude between Antecedents and Consequents: So that the two Antecedents, and the two Consequents, are called the Homologous Terms in any Proportion; and when Triangles are Similar, the Sides which are the two Antecedents or the two Consequents, are called the Homologous Sides: And such Triangles are always to one another as the Squares of such Homologous Sides, as you will find proved under *Triangles*.

HOMOLOGOUS Things, in Logic, are such as agree only in Name, but are of very different Natures; and therefore are the same with what they otherwise call Equivocal Terms.

HOMOPLATA, *Scapule Spatula*, *Scapula Aperta*, the Shoulder-Blades, are two large, broad, and triangular Bones, which constitute the Breadth of the Shoulder; thin, especially in the Middle, but thick in its Processes, and are situated on each Side of the Upper and Back-part of the *Thorax*; the upper Edge of them is called *Costa Superior*; their lower *Costa Inferior*. Each has three Processes; of which, the First runs all along the Middle of their Outside, and is called their *Spine*; whose End, which receives the *Clavicula*, is called the *Acromion*, or the Shoulder-point. *Caracoides*, or *Anchoralis*, is the Name of the Second Process; as the Third is called *Cervix*: These two latter are tied together by a strong Ligament, which serves to keep the Head of the *Humerus* in the Cavity of the *Cervix*. The Use of the *Homoplata*, or *Scapula*, is to receive the Extremities of the *Clavicula* and *Humeri* for the easier Motion of the Arm, and to give Ease to the Muscles which move it.

HOMOTONA, is a continued Fever that acts always alike. *Blanchard*.

HONOUR-POINT, in an Escutcheon: See *Escutcheon*.

HONEY-COMBS, are certain Holes or Cavities within the Body of a great Gun, wherein there is Danger of some Sparks of Fire being lodged; or Pieces of Cartridges, where they lie Paper Cartridges.

HOOKS, of a Ship, are all those forked Timbers which are placed directly upon the Keel, as well in her *Run*, as in her *Rake*.

HOOP-WHEEL: See *Detent-Wheel*.

HOPLO Chrysmata, the *Armarij* or *Weapon Salve*: See *Armarij*.

HORDEATUM, is a liquid Medicine taken inwardly, prepared of Barley beat and boild, with the Addition of suitable and well-strained Liquors; to which are frequently added Almonds, and the Seeds of White Poppies, &c. *Blanchard*.

HORDEOLUM, the same with *Gritha*.

HORIZON, is that Great Circle which divides the Heavens and the Earth into two Parts or Hemispheres, distinguishing the upper from the lower: It's either *Sensible* or *Apparent*, or the *Rational* or *True Horizon*,

The *Sensible* or *Visible Horizon*, is that Circle which limits our Sight, and may be conceived to be made by some great Plain, or the Surface of the Sea.

It divides the Heavens and Earth into two Parts, the one Light, and the other Dark, which are sometimes greater or lesser, according to the Condition of the Place, &c.

It determines the Rising and Setting of the Sun, Moon, or Stars, in any particular Latitude; for when any of these appears just at the Eastern Part of the *Horizon*, we say it *Rises*; and when it doth so at the Western Part, we say it *Sets*: And from hence also the Altitude of the Sun or Stars is accounted, which is their Height above the *Horizon*.

The *Rational*, *Real*, or *True Horizon*, is a Circle which encompasses the Earth exactly in the Middle, and whose Poles are the *Zenith* and *Nadir*; that is, the two Points, one exactly over our Heads, and the other under Feet.

Horizon on the *Globe* or *Sphere*, is a broad wooden Circle encompassing it round, and representing the *Rational Horizon*, having two Notches in the North and South Parts of it for the Brazen Meridian to stand in:

On this broad wooden *Horizon* several Circles are drawn, the innermost of which is the Number of Degrees of the 12 Signs of the Zodiac, viz. 30 Degrees to each Sign.

Next to this you have the Names of those Signs; then the Days of the Month, according to the *Julian Account*, or Old Style, with the Calendar; and then a Calendar according to the Foreign Account, called New Style: And without these is a Circle divided into 32 equal Parts, which make 32 Rhumbs, or Points of the Mariner's Compass, with the first Letters of their Names annexed.

The Uses of this Circle on the Globe are,

1. To determine the Rising and Setting of the Sun, Moon, or Stars; and to shew the Time of it by the Hour-Circle and the Index.

2. To limit the Increase and Decrease of Day and Night: For when the Sun rises due East, and sets West, the Days and Nights are equal: When he rises and sets to the North of the East and West, the Days are longer than the Nights: But the Nights are longer than the Days, when the Sun rises and sets to the Southward of the East and West Points of the *Horizon*.

3. To shew the Amplitude and Point of the Compass the Sun rises and sets upon.

HORIZONTAL, or *Base-Line of a Hill*, how to find: See *Surveying*.

HORIZONTAL Dials, are those whose Planes lie parallel to the Horizon of any Place.

For the drawing of these *Dials*, you must have always given the *Latitude of the Place*, or Height of the Pole above the Horizon, (which is equal to the *Height of the Style*) by the Help of which you may find the *Hours Distance from the Meridian* by the following Proportion:

As the Radius is to the Sine of the *Styles Height*: So is the Tangent of the Hour (or Angle at the Pole): To the Tangent of the *Hours Distance from 12*, (or the *Hour-Arch*)

Example.

Suppose an *Horizontal Dial* was to be drawn for the Latitude of 51 Degrees 32 Minutes.

First, Find the Distance of the Hours 1 and 11 from the Meridian, according to the preceding Canon:

Thus,

To the S. of the *Styles Height* --- 51° 32' --- 9893745
Add the Tangent of the Hour --- 15 00 --- 9428052

Sum --- Rad. = T. of the *H. Arc.* 11° 50' --- 19321797

Which is the Distance of 1 and 11 from the *Meridian Line*.

In like manner find the rest of the *Hours Distances*, and place them in a Table:

Thus,

Latitude 32 Degrees 51 Minutes North.

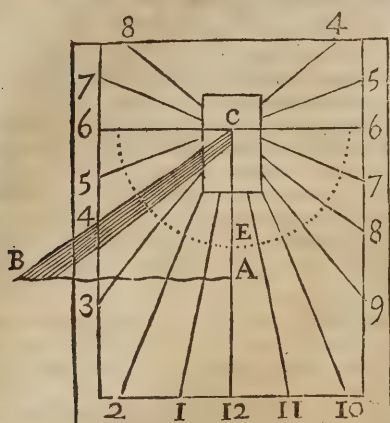
Hours.	Angle at Pole.		Hour Arches.	
	G.	M.	G.	M.
12	00	00	00	00
11 1	15	00	11	50
10 2	30	00	24	20
9 3	45	00	38	03
8 4	60	00	53	35
7 5	75	00	71	06
6	90	00	90	00

For the Style, make the Angle *BCA* = to the Latitude of the Place.

So shall *BCA* be the Style or Cock, which must stand perpendicularly on *C: 12*, and Point due North.

If you would Calculate for every half Quarter, you must say,

As *R: S* Latitude :: *T*, 1 Degree 52 Minutes : To the Tangent of the first half Quarter's Distance from the Meridian ::
So *T*, 3 Degrees 45 Minutes : To *T*, of the first Quarter of an Hour's Distance ::
So *T*, 5 Degrees 37 Minutes : To a Quarter and half Quarter's Distance ::
So *T*, 7 Degrees 30 Minutes : To the half Hour's Distance, &c.



To describe the Dial, Respect must be had to the Bigness of the Plane, and the Place for the Center *C* determined; and then through *C* draw *C* 12 for the Meridian (which will also be the Subtilar-Line and Hour-Line of 12) and at Right Angles to it *C* 6 for the Hour-Line of Six. Then on *C*, with a Line of Chords, whose Radius is proper for the Largeness of the Dial, draw a Circle, and from *E*, both ways, set the several Distances of the Hour-Arks, found by Calculation, in the Circumference of that Circle: Then lay a Ruler to *C*, and draw Lines from thence through all those Divisions, they will be the true Hour-Lines on the Plane of the Dial.

N.B. This Practice serves to draw an *Erect Vertical Dial*; only in Calculation you must use the Complement of the Latitude instead of the Latitude, and the Hours must be numbered differently.

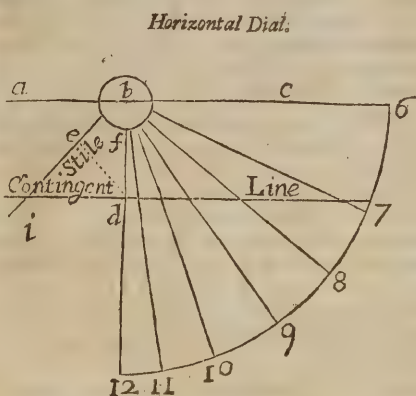
To draw an Horizontal Dial Geometrically.

Let two Lines be drawn Square-wise, viz. bd for the Hour of 12, and bc for the Hour of 6 draw the *Style* be fo, that the Angle ebd may be equal to the Elevation of the Pole; take (where you please) any Point in the Meridian Line, suppose d , from which, unto the *Style*, let fall a Perpendicular as de , and transfer it into the Meridian in df : Then draw id perpendicular to the Meridian in d , for a *Line of Contingence*.

From f_1 as a Center, describe a Circle representing the Equinoctial at any considerable Distance (the bigger the better) and divide it into 24 Parts for Hours, and 48 Parts for Half-Hours: But it is enough for an *Horizontal Dial*, if one Quadrant betwixt the Hours of 12 and 6 be divided into 6 Parts or 12.

Make Points in the *Contingent*, where it shall be cut by a Ruler applied to the Center and every Division in the Equinoctial.

Draw the Hour-Lines from the Center *b*, and every correspondent Point in the *Contingent*; erecting the *Style* over the *Meridian*, according to the Angle *i b d*.



HORIZONTAL Line, any Line drawn parallel to the Horizon upon a Plane: See *Line*.

HORIZONTAL *Parallax*: See *Parallax*.

HORIZONTAL *Projection*: See *Projection*.

HORIZONTAL Range, or *Level Range*, of a Piece of Ordnance, is the Line it describes parallel to the Horizon or Horizontal Line.

Capt. Huley, in *Philos. Trans.* N. 216. gives two very ready Theorems, the one to find the greatest Horizontal Range at 45 Degrees Elevation, by any Shot made upon any inclined Plane, with any Elevation of the Piece whatsoever; and the other to find Elevations proper to strike a given Object with any Force greater than what suffices to reach it with the middle Elevation.

PROP. 1.

A Shot being made on an inclined Plane, having the Horizontal Distance of the Object it strikes, with the Elevation of the Piece, and the Angle at the Gun between the Object and the Perpendicular; To find the greatest Horizontal Range of that Piece, laden with the same Charge; that is, half the Latus Rectum of all the Parabola made with the same Impetus.

R U L E.

Take half the Distance of the Object from the *Nadr*, and take the Difference of the given Elevation from that half; the Versed Sine of that Difference substract from the Versed Sine of the Distance of the Object from the *Zenith*: Then shall the Difference of those Versed Sines: Be to the Sine of the Distance of the Object from the *Zenith*: As the Horizontal Distance of the Object struck: To the greatest Range at 45 Degrees.

PROP. II.

Having the greatest Horizontal Range of a Gun, the Horizontal Distance and Angle of Inclination of an Object to the Perpendicular; To find the two Elevations necessary to strike that Object.

R U L E.

Halve the Distance of the Object from the *Nadir*; this half is always equal to the half Sum of the two Elevations sought: Then say, As the greatest
 $Z \propto 2$ Horizontal

Horizontal Range: Is to the Horizontal Distance of the Object: So is the Sine of the Angle of Inclination, or Distance of the Object from the Perpendicular: To a Fourth Proportional; which Fourth being subtracted from the Versed Sine of the Distance of the Object from the Zenith, leaves the Versed Sine of half the Difference of the Elevations sought; which Elevations are therefore had, by adding and subtracting that half the Difference to and from the aforesaid half Sum.

HORN-WORK, in Fortification, is an Out-work which advanceth toward the Field, carrying in the Fore-part, or its Head, two Demi-Bastions in Form of *Horns*. These Horns, Epaulments, or Shouldrings, being joined by a Curtain, shut up on the Side by two Wings parallel one to another, are terminated at the Gorge of the Work, and so present themselves to the Enemy.

HOROLOGIOGRAPHY, the Art of making *Dials*, *Clocks*, or other Instruments, to shew the Time of the Day.

HOROMETRY, the Art of measuring or dividing the Hours, and keeping Account of Time.

HOROPTER, in Opticks, is a Right Line drawn through the Point of Concourse, parallel to that which joins the Center of the Eye.

HOROSCOPE, a Word in great Request with the Canting Astrologers; and sometimes they put either for a Figure of the Twelve Houses (as they call the Signs of the Zodiac) erected to tell other Men's Fortunes, and to shew their own Folly; or else for the Degree of the Ascendants, or the Star ascending above the Horizon, at the Time the Question is put, any thing enquired for, or a Native born: But most properly *Horoscope* signifies the first House or Ascendant, and is that Part of the Zodiac which is rising at the Time of the Scheme.

HORRIFICA Febris, is that Fever in which the Patient is often seized with shaking Fits and horrible Agonies; 'tis otherwise called *Phricodes*; which see. *Blanchard*.

HORS de son fee, is an Exception to avoid an Action brought for Rent, issuing out of certain Land by him that pretendeth to be the Lord, or for some Custom and Services; for if he can justify that the Land is without the Compass of his Fee, the Action falls.

HORSE, is a Rope in a Ship, made fast to one of the Fore-mast Shrouds, having a Dead Man's Eye at its End, through which the Pendant of the Sprit-sail Sheets is reeved. Its Use is only to keep the Sprit-sail Sheets clear of the Flukes of the Anchors: Also he that heaves the Lead out of the Shrouds, has a Rope which is there fastened to preserve him from falling into the Sea, which also is called a *Horse*, and so also is the *Wap* called, which is that whereby the Shrouds are set Taught, also those little short *Waps* seized to the Middle of the Top-mast and Top-gallant-mast Stay, wherein are reeved the Top-fail and Top-gallant-fail Bowlings, are also called *Horses*.

HORSE-SHOE, in Fortification, is a Work sometimes of a round, and sometimes of an oval Figure, raised in the Ditch of a Marshy Place, or in low Grounds, and bordered with a Parapet. It is made to secure a Gate, or to serve as Lodgment for Soldiers to prevent Surprizes, or to relieve an over-tedious Defence.

HOTCHPOT, in Law, signifies a Commixture, or putting together of Lands of several Tenures, for the equal Division of them: As if a Man, seized of thirty Acres of Land in Fee, hath

Issue two Daughters, and gives with one of his Daughters, to a Man that marries her, ten Acres of the same Land in *Frank-marriage*, and dies seized of the other twenty Acres: Now if she that is thus married will have any Part of the twenty Acres whereof her Father died seized, she must put her Lands, given in *Frank-marriage*, in *Hotchpot*; that is, she must refuse to take the sole Profits of the Lands given in *Frank-marriage*, and suffer the Land to be commixt and mingled with the other Land whereof her Father died seized; so that an equal Division may be made of the whole between her and her Sister, and thus for her ten Acres shall have fifteen, else her Sister will have the whole twenty of which her Father died seized.

HOUNDS, in a Ship, are Holes in the Cheeks at the Top of the Masts, through which the Ties run to hoist the Yards: A Top-mast hath but one *Hound*.

HOURL, is the 24th Part of a Natural Day, containing 60 Minutes, and each Minute 60 Seconds, &c. These are *Astronomical Hours*, which always begin at the Meridian, and are reckoned from Noon to Noon.

But some *Hours* are begun to be accounted from the Horizon, which, when the Account begins at the Sun's Rising, are called *Babylonish Hours*; who begin with the Sun's Rising, and reckoned on 24 *Hours* to his Rising again the next Day.

Others are reckoned after the same manner, only begin at the Sun's Setting instead of his Rising; and these are called the *Italian Hours*, because the *Italians* account their Time after this Fashion.

There is yet another Kind of *Hours*, which are called the *Jewish Hours*, because of old the *Jews* accounted their Time this way: These are one 12th Part of the Day or Night, reckoned from the Sun Rising to Sun Setting (be the Days or Nights long or short;) and these were called, as we find in Holy Scripture, the First, Second, or Third, &c. *Hour* of the Day or Night.

HOUR-CIRCLES, the same with *Meridians*, are Great Circles meeting in the Poles of the World, and crossing the *Equinoctial* at Right Angles: They are supposed to be drawn thro' every 15th Degree of the *Equinoctial* and *Equator*, and on both Globes are supplied by the *Meridian*, *Hour-Circle*, and *Index*.

The Planes of the *Hour-Circles* are perpendicular to the Plane of the *Equinoctial*, which they divide into 24 equal Parts.

HOURLINES, on a Dial, arise from the Intersection of the Plane of the Dial, with the several Planes of the *Hour-Circles* in the Sphere, and therefore must be all Right Lines.

To find the Hour of the Day Trigonometrically, having the Latitude of the Place, the Sun's Altitude at Six, and present Altitude given.

In Summer.

Say, As the Co-sine of the Latitude is to the Difference of the Sines of the Altitude at Six, and present Altitude: So is the Radius to the Sine of the Hour from Six.

In Winter.

Say, As the Co-sine of the Latitude: Is to the Sum of the Sines of the Altitude at Six, and present Altitude: :

So is the Radius: To the Sine of the Hour from Six.

To find the Hour of the Day, having the Co-Latitude of the Place = 38 Degrees 30 Minutes.

The Sun's Co-Altitude = 60 Degrees, and his Co-Declination = 76 Degrees 53 Minutes;

Proceed and set all things thus;

Co-Latitude 38° 30'	{ whose Compl. } = 0.205853
Co-Declinat. 76° 53'	{ whose Compl. } = 0.011481

Difference 38° 23'
Co-Altitude 60 00

Sum 98 23
Difference 21 37

Half Sum 49 11
Half Differ. 10 48

Sine 9.878984
Sine 9.272726

Sum of all the 4 Sines 19.379044

Their half Sum 9.689522

Which last Logarithm is the Sine of 29 Degrees 17 Minutes, and this doubled, gives 58 Degrees, 17 Minutes; and then converted into Time, gives 38 Hours 51 Minutes, and so much did it want of Noon then; that is, 'twas 8 a-Clock, and 9 Minutes before Noon.

HOUSED-IN, the Seamen say of a Ship, which, after the Breadth of her Bearing, is brought in too narrow to her upper Works, that she is *Housed-in* or *Pinched-in* too much.

HOWLE, when the Foot-hooks of a Ship are scarfed into the Ground-Timbers and bolted; and then the Plank laid on them up to the Orlop, the Carpenters say, they begin to make the Ship *Howle*.

HOY, is a small Vessel or Bark, whose Yards are not a-cross, nor the Sails square like those of Ships; but her Sails are like a Miffen, and so she can lie nearer the Wind than a Vessel with cross Sails can do. A *Ketch* is a smaller Vessel of this Kind.

HOYSE, is the Sea Word for haling up any thing into the Ship for getting up a Yard, &c. Thus they say, *Hoise up the Yard!* *Hoise the Water in!* &c.

HUE-AND-CRY: *Manwood*, in *Forest Law*, c. 19. Num. 11. saith, That *Hue* signifies the Complaint of the Party, and *Cry* is the Pursuit of the Felon upon the High-way upon that Complaint; for if the Party robbed, or any in the Company of one robbed or murdered come to the Constable of the next Town; and will him to raise the *Hue-and-Cry*, (that is, make the Complaint known, and follow the Pursuit) after the Offender, describing the Party, and shewing, as near as he can, which way he went; the Constable ought forthwith to call upon the Parish for Aid in seeking the Felon; and if he be not found there, then to give the next Constable Notice, and the next, until he be apprehended, or at least, until he be thus pursued unto the Sea-side.

HUROSCOPE: See *Hydroscope*.

HULL of a Ship, is her Main Body, without any Masts, Yards, Sails, or Rigging.

To *Hull*, or lie a *Hull*, is spoken of a Ship, when either in a dead Calm (to preserve her from beating her Sails against the Masts) or in a Storm when she can't carry 'em, all her Sails are taken in to preserve them, so that nothing but her *bare Poles*, her Masts, Yards, and Rigging are abroad; this is called *Hulling*; her Helm is tied down to the Lee-side of the Ship, and then if she be a good Sailer, she will lie easily under the Sea, and make her way one Point before the *Beam*.

HULLOCK of a Sail, is when in a great Storm some small Part of a Sail is cut and left loose: It's chiefly used in the Miffen-sail, to keep the Ship's Head to the Sea, then all the rest of the Sail is made up, except a little at the Miffen-yard Arm: Also when a Ship will not *Weather-Coil*, to lay her Head the other way, they loose a *Hulloek* of her Fore-sails; and then changing the Helm to the Weather-side, she is then made to fall off, and to lay her Head where her Stern lay before.

HUMECTATION, is the moistening of any mixt thing, in order to prepare it for some Operation, or that its best or finest Parts may the better be extracted: Thus *Agarick*, &c. are moistened while they are pounding, lest they should exhale too fast; and *Cassia* is moistened, the better to extract its Pulp.

HUMERUS, the Shoulder-bone, being the first Bone of the Arm; 'tis long and round, its Substance or Fibres are pretty solid and compact; it has a wide and long Cavity in its Middle, in which is contained its Marrow. At its upper-end it has a round Head covered with a Cartilage, which is received into the Cavity of the Neck of the *Scapula*; but because this Head is much larger than the Cavity, therefore it is surrounded with a strong Ligament, which rises from the Edge of the Cavity of the *Scapula*. At its lower End it has two Protuberances; the one External, which receives the Extremity of the *Radius*; the other Internal, which is received into the Semi-circular *Sinus* of the *Ulna*: On the Fore-side of this Protuberance there is a small *Sinus*, which receives the fore Process of the *Ulna*; and on the back-side there is another large *Sinus*, which receives the *Olecranium*. There is another small Protuberance on the Side of this, from which the Muscles that lie on the Inside of the Arm arise.

HUMID: *Bloom*, in his Heraldry, gives you a *Fesse* of this Form, which he calls *Fesse Humid*.



HUMIDITY, is the Quality which we call Moisture, or the Power of wetting others, which some Liquors and Fluids are endowed with. This differs very much, from *Fluidity*, as you may see under that Word; and seems to be merely a relative thing depending on the Congruity of the Component Particles of the Liquor, to the Pores of such particular Bodies as it is capable of adhering to, penetrating a little into, or wetting.

Thus, for Instance, Quicksilver is not a moist Liquor, as to our Hands or Cloaths; but may be called so in reference to Gold, Tin, or Lead, to whose Surfaces it will presently adhere. Now even Water it self that wets almost every thing, and is the great Standard of Moistured and *Humidity*, is

not capable, as it appears, of wetting every thing; for it stands, and runs easily off in Globular Drops on the Leaves of Cabbages and many other Plants, and will not wet the Feathers of Ducks, Swans, and other Water-Fowl, as it will other Things. And that Texture only may cause a Fluid to be *Humid*, is plain from hence, That though neither Quicksilver alone, Lead, or Bismuth will adhere to Glafs; yet being mixed together, they will form a Mass that will do so; as is plain from such a Composition being frequently used to Foliate Looking-Glasses, Vid. Mr. Boyle's *History of Fluids and Firmness*, Pag. 187.

HUMILIS: See *Deprimens*.

HUMOURS: The Ancients made four *Humours* in the Blood, the Bilious, Pituitous, (Yellow and Black Choler) Melancholick, and the Blood, properly so called, and that according to the four Peripapetick Elements: But this Opinion is cashier'd, since the Invention of the Circulation of the Blood; yet they are found when the Blood preternaturally departs from its due Temperature; but they do not constitute an integral Part of the Blood, for the Blood is only one *Humour*; if otherwise, Tartar in Wine, and Dregs in Beer, were constituent Parts of Wine and Beer. In Blood that is let, there appear only three different Species of Bodies; for in the Surface you see a Kind of a Fibrous Crust of coagulated Blood, which spreads it self over the whole Mass; then you see certain red Particles amongst the Fibres, which grow black about the Bottom by reason of their Fewness: Lastly, you see the *Serum* wherein it swims. But if any one will proceed more accurately, distil the Blood, and dissolve it Chymically, he shall find five pure Bodies in it; to wit, Spirit, Sulphur, or Oil, Water, Salt and Earth.

There are three general *Humours* which wash the whole Body, Blood, Lympha, (a sort of pure Water) and the Nervous Juice; but there are several particular *Humours*, as Chyle, Bile, Spittle, Pancreatic Juice, Seed, &c.

There are also *Humours* in the three Membranes that cloath the *Fetus* in the Womb, which are three in those Animals that have Bladders: At the Beginning, when the Egg falls down from the *Ovaria* into the Womb, the *Humours* which are to this Purpose in the Bottom of the Womb, first sink into the Membrane called *Chorion*, and then into the *Amnion*; but in Process of Time, when the *Fetus* is formed, and the Navel-Vessels are extended to the *Chorion* and the *Amnion*, we imagine that the Nutritious *Humour*, being received by the Opening of the Veins, is carried to the *Fetus*, and thence, by the Arteries, some Part of it is carried into the *Amnion*, as into the Child's Store-house; so that at the said time the Liquor of the Membrane *Amnion* may be increased upon this double Account. *Blanchard*.

At last, when the Time of Delivery draws near, that way of Sweating through seems to cease, and the others only take Place; unless, (as *Wharton* writes) the Nutritious *Humour* descend from the *Placenta* by the Navel-String, and by the little soft Protuberances, thence pass into the Cavity of the *Amnion*: The Use of these *Humours* is to nourish the *Fetus* at the Mouth.

The Third *Humour* is the Urine, which flows from the Bladder by the Urinary Passage, into the Urinary Membrane.

HUMOURS of the Eye, are Three: The Watery or Aqueous, which is contained between the *Tunica Cornea* and *Uvea*.

2. The *Crystalline* or *Icy Humour*, which is contained in the *Tunica Uvea*, and is thicker than the rest.

3. The *Vitreous* or *Glassy Humour*, bigger than any of the rest, fills the backward Cavity of the Eye.

The *Aqueous Humour* serves to moisten and levigate the two other denser *Humours*, as also the *Tunica Uvea* and *Retina*, and perhaps (saith *Diemerbroeck*) to nourish them too: When this fails, grows dreggy, or too thick, the Sight presently grows dull and imperfect. If it be so dreggy as that pretty large Particles are formed, and swim about in it, the Person fancies he see Flies and Motes always before his Eyes; and if these Particles grow altogether in a Film or Membrane, and so come to cover the Pupil, 'tis called a *Suffusion*, which is the Beginning of a *Cataract*.

The *Vitreous Humour*, some say, serves to dilate the Rays which it receives from the *Crystalline*, and to bring them to the *Retina*; or, as others think, it helps to collect the Rays refracted by the *Crystalline* into one Point, that the Vision may be the more distinct and vivid.

The *Crystalline Humour*, which some call *Glaucialis*, is the primary Instrument of Vision, in respect of its Collecting and Reception of the Rays, which coming hither, dilated by the *Aqueous Humour*, are collected and conveyed to the *Retina*.

HURDLES, or *Clays*, in Fortification, are made of thick and small Twigs of Willows or Osiers, being 5 or 6 Foot high, and from 3 to 4 Foot broad. They are interwoven very close together, and usually laden with Earth, that they may serve to render Batteries firm, or to consolidate the Passage over muddy Ditches; or to cover Traverses and Lodgements for the Defence of the Workmen, against the Artificial Fires or Stones that may be cast upon them.

HURTS, a Term in Blazony: See *Balls*.

HUSTINGS, a Court held before the Lord-Mayor and Aldermen of *London*; an Error or Attaint lies there of a Judgment or false Verdict in the Sheriff's Court.

HYALOIDES, is the Vitreous Humour of the Eye, contained betwixt the *Tunica Retina* and the *Uvea*.

HYBERNAL Occident: See *Occident*.

HYBERNAL Orient: See *Orient*.

HYBONA, is an Incurvation of all the Vertebres.

HYDATIDES, are little Watery Bladders in the Liver, Spleen, or some other Viscus, common to Hydropical Persons: But Dr. *Tyson* supposes them to be a Species of Worms, or imperfect Animals.

HYDATOIDES, is the Watery Humour of the Eye, contained betwixt the *Tunica Cornea* and *Uvea*.

HYDRA, a Southern Constellation, consisting of 26 Stars, and imagined to represent a *Water-Serpent*.

HYDRAGIA: See *Vena Lymphatica*.

HYDRAGOGUES, are Medicines which, by Fermentation and Precipitation, purge out the Watery Humours.

The Ancients thought this was done by some peculiar Texture, and that thence its Virtue arose to purge away Serofities or Watery Humours only.

HYDRAULICS, the Art of making all sorts of Engines to carry or raise Water, or which are moved by Water, and serve for other Uses: The Word

Word signifies Sound made by Water, because when Organs were first found out, they were blown by the Fall of Water instead of Bellows.

You have many Ancient Water-Engines described by *Heron*, and which are called *Machina Hydraulica*. *Arbenaus* attributes the Invention of the Water-Organ to *Ctesibius* but others say *Plato* first found out the founding *Clepsydra*, which told the Hour of the Night by the Noise of Pipes blown by the Air forced by the Fall of Water: Mr. *Ozonam* confounds this Word with *Hydrostatics*.

HYDRAULO-PNEUMATICAL Engines, are such as raise Water by means of the Spring (either Natural or Forced) of the Air.

The Honourable Mr. *Boyle* mentions a very pretty Fountain, which he calls *Hydraulto-Pneumatical*, and which was made by the Spring of the Air pressing up Water in a Pipe, when in the Exhausted Receiver the Weight of the Atmosphere was taken off: See *Continuation of Physico-Mechanical Experiments*, Exper. 4.

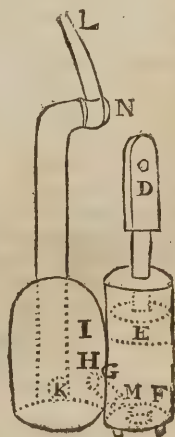
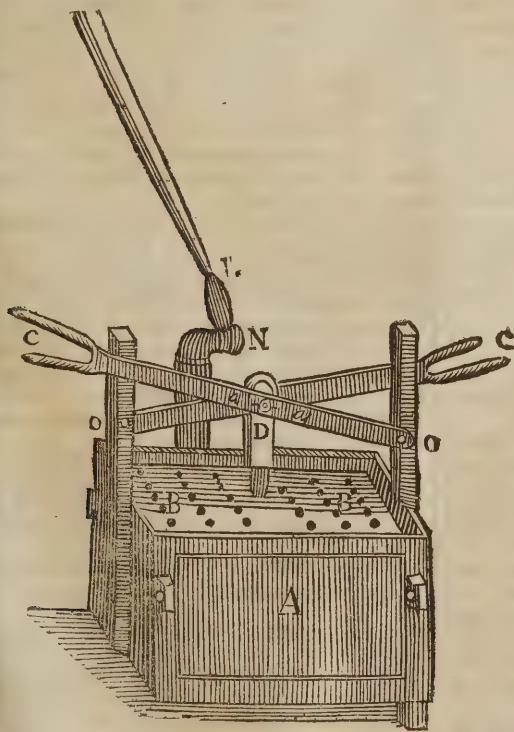
And you may easily try the thing, if you fill but any middle siz'd Vial about half full of Water; and then, with Sealing-Wax or Cement, fasten in its Neck a long slender Glass Pipe, (a Piece of Tobacco-pipe or Quill will do) one of whose Ends shall be below the Surface of the Water in the Glass; for then, if the Mouth of the Bottle be accurately stopp'd, the Warmth of your Hand only will so increase the Spring of the included Air, that it

will make the Water rise up, and run out at the Top of the Pipe; and if you blow strongly in at the Top, and force a good Quantity of Air into the Bottle, the Spring of the Air so forced in, will, on the Removal of your Mouth, drive the Water up the Pipe with a great Force; and if the Orifice be very slender, or the Cavity of the Pipe very small, it will make the Water imitate an Artificial Fountain, which will keep running for near half a Minute.

A Description of the Common Hydraulick Engine used to quench Fire, &c. from Philosph. Trans. Numb. 128.

The Engine is a Chest of Copper, as *A*, transportable by means of two wooden Bars, like a Sedan or Chair. This Chest is pierced with many Holes above *B B*, and holds within it the Body of a Pump *E F M*, whose Sucker *D E* is raised and abased by two Leavers *C O*: These Leavers have each of them two Arms, and each Arm being fitted to be laid hold on by both Hands of a Man. Each Leaver is pierced in the Middle by a Mortise *a a*, in which an Iron Nail, which passes through the Handle of the Sucker, turns round when that Sucker is raised or lowered.

Near the Body of the Pump there is a Copper Pot *I H K*, join'd to it by the Tube *G*; and having another Tube *K N L*, which in *N* may be turned every way.



To make this Engine play, Water is poured up on the Chest, to enter in at the Holes that are in the Cover thereof: This Water is drawn into this Body of the Pump at the Hole *F*, at the Time when the

Sucker is raised; and when the same is let down, the Valve of the same Hole *F* shuts, and forces the Water to pass thro' the Hole: For in the Tube *G* of which the Valve *H* being lifted up, the Water enters

enters into the Pot, and filling the Bottom, it enters thro' the Hole *K* into the Tube *KNL*, in such a manner, that when the Water is higher than the Tube *KNL*, and the Hole of the Tube *G* is shut by the Valve *H*, the Air inclosed in the Pot hath no Issue; and it comes to pass, that when you continue to make the Water enter into the Pot by the Tube *G*, which is much thicker than the Aperture of the End *L*, at which it must issue, it must needs be, that the Surplus of the Water that enters into the Pot, and exceeds that which at the same time issues through the small End of the Jet, compresses the Air to find Place in the Pot, which makes that, whilst the Sucker is rais'd again, to make new Water by the Force of its Spring, mean time that a new Compression of the Sucker makes new Water to enter, and causes also a new Compression of Air: And thus the Course of the Water which issues by the Jet, is always entertained in the same State, because that proportionably, as the Impulse is strong, the Water entering faster, and consequently in greater Quantity into the Pot, makes a greater Compression of the Air, which, the more strongly it is compress'd and penn'd in, returns also with the greater Force into its Native State, by means of its Spring, and therefore throws out the Water with greater Force.

HYDRENTEROCELE, is a Falling of the Intestines, together with Water, into the *Scrotum*. *Blanchard*.

HYDROA, are certain little, broad, moist, itching Pimples, like Millet-seed; sometimes without itching, which render the Skin ulcerous and rough; tho' to expel the Sweat by the Skin, is hindered sometimes by its Thickness; so that the Matter being lodged there, and the subtiler Parts being either carried back by the Lymphatick Vessels, or evaporated, the Skin swells. This Distemper is familiar and common to Boys and young Men, especially of a hot Constitution, when they use too much Exercise in Summer: It infects the Neck, Shoulder-blades, Breasts, Arms, Thighs, yet more frequently the Secret Parts and the Fundament. *Blanchard*.

HYDROBELE, is a swelling of the outermost Skin of the *Scrotum*, proceeding from a Watery Humour. *Blanchard*.

HYDROCEPHALUM, is a Swelling of the Head, by reason of a watery Humour; whence the Sutures of the Brain are forced asunder; it proceeds sometimes from a Bursting of the Lymphatick Vessels. *Blanchard*.

HYDROGRAPHICAL-CHARTS, are certain Sea Maps, delineated for the Use of Pilots and other Mariners; wherein are mark'd all the Rhumbs or Points of the Compass and Meridians parallel to one another, with the Shelves, Shallows, Rocks, Capes, &c.

HYDROGRAPHY, is an Art which teacheth how to describe and measure the Sea; giving an Account of its Tides, Counter-Tides, Soundings, Bays, Gulphs, Creeks, &c. As also the Rocks, Shelves, Sands, Shallows, Promontories, Harbours, Distance from one Port to another, and other things remarkable on the Coasts.

HYDROMANCY, a pretended Divination by Water.

HYDROMEL, Mead, is a Decoction of Water and Honey.

HYDROMPHALUM, is a Protuberance of the Navel, proceeding from Watery Humours in the *Abdomen*. *Blanchard*.

HYDROPHOBIA, is a Distemper highly Convulsive, accompanied with Fury, and shunning of all things that are Liquids and Splendid; sometimes

with a *Delirium*, a Fever, and other Symptoms, and not without great Danger of Life, proceeding from the Bite of a mad Dog, or a Contagion analogous to it.

In *Philosop. Transact. N. 147*. there is an Instance of one having this Disease, occasioned by the Bite of a mad Dog.

HYDROPICA, are Medicines that expel the Watery Humour in a Dropie.

HYDROPS, a Stagnation of the Watery Humour in the Habit of the Body, or some Cavity of it: And it is either General, as an *Anasarca*, and *Ascites*; to which some add a Tympany, but ill: Or Particular, confined to one Part, as a Dropie in the Head, Breasts, Hand, Foot, &c. *Blanchard*.

HYDROPS ad Matulam, the same with *Diabetes*.

HYDROSTATICKS, is that Part of Statics which relates to the Gravities and *Equilibria* of Liquors; and also comprehends the Art of Weighing Bodies in Water, or some other proper Liquor, thereby to estimate their Specifick Gravity, and to deduce thence many other useful Theorems.

And this is observed by the Honourable Mr. *Boyle* is a Part of Philosophy which ought to be looked upon as the most ingenious of any: The Theorems and Problems of this Art, being handsome Productions of Reason, and affording Discoveries, not only pleasing, but also surprizing and wonderful: Nay, very many of the most familiar, as well as most abstruse Phenomena of Nature, can hardly ever be thoroughly understood without Hydrostatical Principles. 'Tis an Art also not only delightfully Speculative, but practically Useful: It may be of the highest Importance to Shipping and Navigation, to those that deal in Salt-works, and to those whose Business 'tis to enquire into the Gravities and Magnitudes of some Bodies; the exact Knowledge of which would very much conduce to their Interest. But of the great Usefulness of this Art, see more under *Specifick Gravity*.

And that Admirable Gentleman, the Honourable Mr. *R. Boyle*, considering that all Persons are not acquainted with, and cannot readily digest rigid Mathematical Demonstrations, that it might be of great Advantage to prove the Truth of such useful Propositions, as those given us by Hydrostatical Writers, in a Sensible and Physical way: As also, That some things before passing for receiv'd Truths, would then be discover'd to be palpable Errors, as well as many Noble and useful Discoveries this way communicated to the World:

Considering this, I say, That Noble Author reduced the chiefest of the Hydrostatical Theorems into the following Paradoxes; which you will see he made clearly out by Experiment and sensible Proof.

Though before he comes to them, he thinks fit to premise these things as *Positata* or *Lemnata*.

1. That if a Pipe, or Tube, open'd at both Ends, and placed perpendicularly to the Horizon, have its lower Orifice under Water, there will pass an Imaginary Plane or Surface parallel, as to Sense, to the upper Surface of the Water, which shall touch that lower Orifice of the Tube.

2. That each Part of this Surface or Plane will be alike press'd (if at all) by the Weight of the perpendicularly incumbent Water, which cannot but be granted, since the Water being suppos'd an homogenous Fluid of equal Gravity every where, and equally high above the aforesaid Plane, there can

no reason be assign'd why any one Part of it should be more or less pressed than any other.

3. That though in this Case the Liquor will keep its former Position, yet if any one Part of it comes to have a greater Weight incumbent on it than another, then that Part will be displaced and depressed; as is the Case when a Stone or other Body, specifically heavier than Water, sinks down in it, and tends to the Bottom.

For in what Part soever of the Water the Stone is, that part being more pressed upon than the rest, must yield and give way to the Motion of the Stone downward, till it come to the Bottom.

And on the other Hand, if any Part of this imaginary Surface be less pressed upon than the rest, it must, by the greater Pressure of the rest, be impelled upwards, till it have an height equivalent to balance the Pressure made on the other Parts of the Water; which latter Part will appear highly reasonable and grantable by any attentive Considerer.

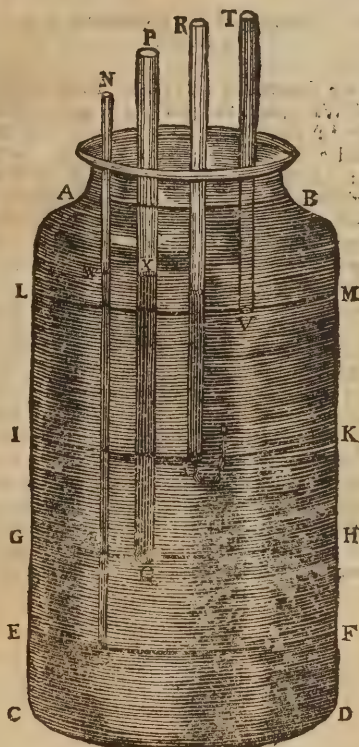
And its Truth in Fact he proves by this Experiment:

If a small Tube, open at both Ends, be held or placed perpendicularly a little beneath the Surface of the Water, in any Vessel; [Note, 'Tis best to use one of Glass, that the Experiment may be the more visible;] then will the Water rise in the Tube as high and a little higher (for a Reason which you will find given hereafter) than the Surface of the Water without: But if you gently pour Oil of Turpentine, or any other Liquor which will not mix with Water, upon that contained in the Vessel, you will see, that as the Oil grows higher and higher on the Surface of the Water, and presses consequently more and more upon it, so will the Water rise within the Orifice of the Tube; and descend again proportionably as you take off the Oil; which plainly proves, That the Weight of the Oil pressing more on the Surface of the Water without the Tube, than the bare Air only can do within it, forces up the Water so high in the Tube, till the Cylinder of Water within the Tube, doth as much gravitate on that Part of the Water under the Orifice of the Tube, as the Air, Oil and Water together do on all the others, without it.

PARADOX I.

That the Upper Parts of all Fluids, as Water, &c. do press upon the Lower.

Provide a Glass Jarr, near of the Shape in the Figure annexed; (though a long Drinking-glass, like that used for Mum, may do well enough.) Fill it with Water near full, as up to AB: Then take a small Glass Pipe or Tube, open at both Ends, and dipping the lower End into Oil of Turpentine, you may, by stopping the Top with your Finger, suspend as much of the Oil as you please in the Tube: This done, move the Tube into the Glass of Water; and thrust it down till the upper Surface of the Oil in the Tube, be near as low as the upper Surface of the Water: And when you take your Finger from the Top of the Tube, you will see the Oil will not run out at the lower Orifice of the Tube. Nay, if you thrust the Tube lower down into the Water, that Liquor will rise up into the Tube, and bear the Oil above it; but if you raise the Tube up, so that the upper Surface of the Oil in it be higher considerably than that of the Water, the Oil will

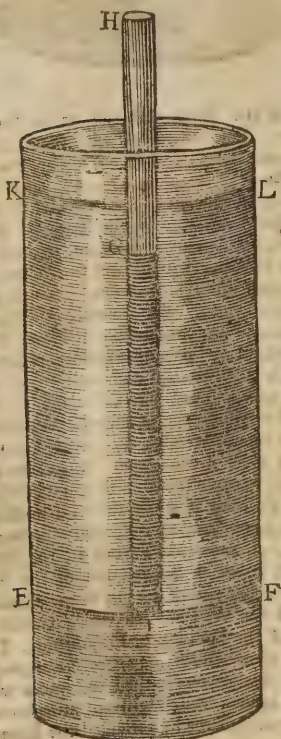


drop out of the Tube, and rise up to the Top of the Water. The Reason of which is this: When the Imaginary Surface *GH*, on which the End *Q* of the Tube *PQ* leans, is as much, and no more, pressed upon by the Oil in the Pipe, than the other Parts of that Surface are by the Parts of the Water perpendicularly incumbent on them, there is an *Equilibrium* between the Oil and the Water, and so the Oil cannot run out; and when you sink the Tube down as low as *O*, the incumbent Water doth more gravitate on the Surface or Plane *EF*, than the Oil in the Tube doth on the Part under it; and consequently the Water will be forced up into the Tube, and will bear the Oil above it; and the Water will rise so high, as that the Water and Oil together in the Tube *NO*, do gravitate as much on the Surface *EF*, as the other incumbent Parts of the external Water do: But if you raise the Tube up into the Position *RS*, the Oil in it pressing more on the Imaginary Surface *IK*, than the incumbent Water doth on any other Part of it, the Oil must run out, till so much descend out of the Tube as will bring the Gravity of the Oil to an *Equilibrium* with that of the Water. All which plainly prove the Truth of the Paradox or Proposition, *That the upper Parts of all Fluids, do gravitate or press upon the Lower.* For if you try the Experiment with any two other Liquors, which will not mingle one with another, it will succeed; provided the Bore of the Pipe be not too large.

PARADOX II.

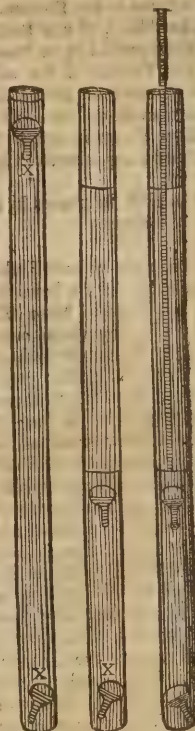
That a lighter Fluid may gravitate or press upon a heavier.

Fill the former Jarr with Oil of Turpentine, instead of Water, and then place in it a Tube of the same Bore as the former, in which you shall have suspended a Column of Water, as before you had of Oil: And you will find that though the Water be heavier than Oil of Turpentine, yet if you do not take your Finger from the upper Orifice till such time as you have sunk the Pipe so low as that the upper Surface of the Water in it be a little below the Surface of the Oil in the Glass; I say, that then on taking off your Finger, you will find the Water in the Pipe will not run out: That if you sink the Tube lower, or pour more Oil into the Vessel, the Oil will rise up in its Lower End; and that if you raise it higher, the Water will run or drop out, and fall to the Bottom of the Vessel. Which plainly shews, That a Liquor lighter in Specie, may buoy up and keep suspended one that is heavier; and the Reasons are in effect the same as those given for the Solution of the Phenomena of the First Paradox; the only Difference being, that the Oil and the Water have changed Places, the Oil now being in the Jarr, and the Water in the Tube.



This Second Paradox our Author also very ingeniously illustrates and confirms by the following Experiment.

Into a long Glass Pipe, sealed at one End, and whose Bore was about half an Inch in Diameter, he poured a Quantity of Water, and then having a small Glass Bubble about the Bigness of a Pea, with a very small and slender Stem, as you see in the Figure annexed; which Bubble was exactly



poised, by forcing Water into it, that tho' it would not sink in a Vessel of Water, yet a very little more Weight would make it do so.

This Bubble being put into the Glass Pipe, did swim on the Top of the Water contained in it; but when he poured Oil of Turpentine (very gently, to prevent confounding the Two Liquors) on the Water in the Pipe, and that till it had attained a convenient Height above the Surface of the Water, he found that the Bubble, which before swam on the Surface of the Water, did now sink down to the Bottom, and stay there as long as the Oil was kept upon the Water; but if either the Tube was very much inclined any way, or if the Oil, by a Siphon or otherwise, were drawn off, the Bubble would then emerge to the Top.

The Reason of which Phenomenon he truly states to be this, That when the Oil was poured on, that did (though a lighter Fluid by its proper Gravity) press on the Water on which it was incumbent, and by that Means did force some of it to enter in at the little Stem of the Bubble; which, by that means being rendered in the whole more heavy, did sink to the Bottom: But when the perpendicular Pressure of

of the Oil upon the Water was taken off, by inclining the Tube, or removed by drawing off the Oil quite, the Air in the Bubble, which before was compressed, did now by its Spring force out the newly admitted Water again; and so reduce the Bubble to its former Degree of Gravity, so that it would be suspended in the Water as before.

He found also, that pouring on more Water would produce the same Phenomenon, if, by a Wire, he first thrust down to, and then kept at the Bottom of the Tube the aforesaid poised Bubble; for though it would readily emerge on the removal of the Rod or Wire, when no more Water was poured into the Tube, yet, that if the Wire kept the Bubble at the Bottom till he had poured in more Water, to about two or three Foot high, into the Pipe, the Bubble would then, on the removal of the Wire, stay there, and not rise at all till the same Quantity of Water was taken out which was before added: Which Experiment doth Nobly Illustrate and Prove his first Proposition, *That the upper Parts of the same Fluid, do press or gravitate on the lower.*

PARADOX III.

If a Body contiguous to the Water be altogether, or in Parts, lower than the upper Surface of the Water, the lower Part of the Body will be pressed upward by the Water which toucheth it beneath.

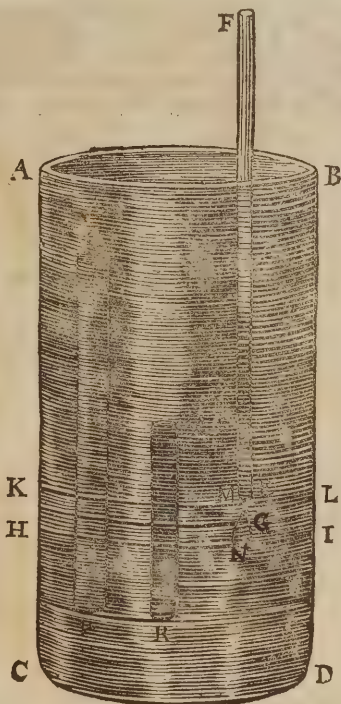
This appears from the *First Experiment*, where the Oil of Turpentine was kept in an open Tube from descending, or running out of it, by the Pressure upwards of the Water on its lower Parts.

And by the *Second Paradox* it appears, that Oil, a lighter Fluid, could press upwards, or keep Water, a Fluid in Specie heavier than it, suspended in an open Pipe.

But in order to estimate how much the Pressure of the Water against the lower Parts of any Body doth amount to, let us suppose a Parcel of Oil, heavier than Water, as suppose that of Cinnamon, Cloves, Guaiacum, &c. were taken up into a Tube, and then that Tube were, as in the former instance, immersed into a Vessel of Water, and there placed so shallow, that the Oil, on removing of the Finger from the Top of the Tube, would drop out. The Drop G, being heavier in Specie than Water, would (by *Lemma 3.*) sink to the Bottom, but not so quickly as it would in the Air; and since, if it were of a Matter equi-ponderant to Water, 'tis plain it could not sink at all, any more than emerge; it doth now sink by no greater a Degree of Gravity, than that by which it surmounts a Quantity of Water equal to it in Bulk: And therefore it will lose in the Water just as much of the Weight it would have in the Air, as so much Water as is equal to it in Bulk, if weighed in the Air also, would amount to: which is a Physical Demonstration of the *Grand Theorem of Hydrostatics*, first put in a clear Light by our Noble Author Mr. Boyle.

The Pressure of Water also against the lower Parts of any immersed Body, is confirmed by attending to the Reason why any Body lighter in Specie than Water, doth emerge out of it; which is this, That there is a greater Pressure or Weight on every other Part of the imaginary Surface of the Water (as suppose *I K* in Fig. 1.) than there is on that, on which the emerging or rising Body leans; and consequently to produce an *Equilibrium* in the Fluid, the Parts immediately under the rising Bo-

dy being pressed by the rest every way, must continually force it upwards, till it attain the upper Surface of the Water: For the emerging Body is



continually pressed upon by two Columns of Water, one bearing against its upper, and the other against the lower Parts; the Length of both which Columns being to be accounted from the Top of the Water, that which presses on the lower Part, will be the longer by the Thickness of the ascending Body, and consequently over-balance it by the Weight of as much Water as will fill the Space that Body takes up: Wherefore the greater Disparity there is between the Specific Gravities of Water and the emerging Body, and the larger the Particles are that emerge, the swifter will they ascend.

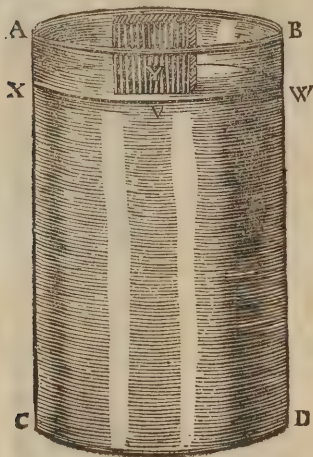
And this will help us to account for these things.

1. For the Reason of that Experiment, That if two Pieces of a Stick of the same Bigness, but of unequal Length, as *OP*, and *QR*, are permitted to rise from the Bottom of a Vessel of Water at the same time, the longest will come first to the Top, which must be because the Columns of Water which press against the lower Ends of both, being equal, but that shorter which presses on the upper End of the longer Piece, it must be less pressed downwards than the other, and so by the general Pressure upwards will rise fastest.

2. From hence we may easily conceive one Reason, (for I assert not that 'tis the only one) why very minute Corpuscles, either higher or heavier in Specie than the Liquor they are mingled with, may be kept there a good while without emerging to the Top, or precipitating to the Bottom: For their

Thickness being indefinitely made small, the Difference between the two Columns before mentioned, will be so too, and consequently either of them can very little over-balance the other.

3. We may from hence account for the Quantity of that Part of any Floating Body which is beneath the Surface of the Water, *which is always in Bulk equal to as much Water as the whole Floating Body doth weigh*: For this Floating Body doth by its lower



Part presses on the subjacent Parts of the imaginary Surface of the Water *XW*, just as much as the Columns of Water to the Altitude *AX* or *BW* do on all other Parts; that is, just as much as the Water would do if it were in the Space which the Part immersed takes up, or as much as a Quantity of Water equal in Bulk to the immersed Part would do.

And from hence 'tis clear, That the Weight of that mighty Ship, the *Royal Sovereign*, is the same with that of so much Water as is in Bulk equal to the immer'd Part of her, or to that Part of her Hull which is underneath the Surface of the Sea. Which Assertion Mr. Boyle found accurately enough to hold true by the following Experiment:

A broad shallow Vessel of Glass being near filled with Water, he placed floating in it a Glass Tumbler or short Drinking Glass; and to make it a little resemble a Ship, he fitted a Wooden Deck, with a Mast, &c. to it; and then he sunk it by ballasting it with Sand, and made it draw as much Water (as the Seamen say) as he thought fit: Then did he, by accurate Marks, distinguish how high the Water in the containing Glass did rise on the Sides of the Vessel: This done, he took the Tumbler out, wiped it dry, and weighed it, and then found a Quantity of Water exactly equal to that Weight: which Water, when put into the broad Glass, rose up to those Marks exactly which he had before observed the Tumbler had raised the Water to.

PARADOX IV.

That to account for the raising of Water in Pumps, &c. there needs only the competent Weight of an External Fluid.

Take up in a slender Glass Tube about an Inch in height of any deeply tinged Liquor (such as an Infusion of Brazil-wood and Cochineal; &c. in Water, for else the Phenomena will not be conspicuous) and then stopping the upper End with your Finger, place it in a Glass Vessel filled with the same tinged Liquor, and that so low, that the upper Surface of the Liquor in the Tube be at least an Inch below that of the Liquor of the Vessel: Then pour on Oil of Turpentine for about 3 or 4 Inches height above the Water in the Vessel, and you will see, on the removal of your Finger from the Top of the Tube, that the tinged Water will be raised or impelled upward near as high as the Surface of the Oil.

Now here no abhorrence of a Vacuum can be pretended, as the Cause of the Ascent of the Water, for the Tube is full of Air, and the External Air hath a free Ingress into it: But the plain Reason is this, That there being a greater Pressure made by the Oil and Water together on the imaginary Plane that passes by the lower Orifice of the Tube without the Tube, than within it, (for within there is a Pressure only of an Inch of Water, and of a Column of Air) the Parts of the Water at the Bottom of the Pipe must be thrust upwards into it, till it rise so high as to gain an *Equilibrium* with the rest.

And this will easily account for the Ascent of the Water in the Pumps:

Where the external Air presses every where on the Surface of the Water in the Well, but not on that within the Pump, because 'tis taken off by the Sucker; which is therefore with soft Leather, &c. made stanch on purpose.

On the raising therefore of the Sucker, the Water must follow it (if the Pump be good) because the Weight of the whole Atmosphere presses on the Surface of the Water in the Well, (but not at all within the Body of the Pump) and so raises or forces it up into the Cavity of the Pump. And that this Pressure of the Air is the Cause of the Waters rise, is more than probable, because no Pump can ever raise Water above 33 or 34 Foot; which is found to be exactly agreeable to the different Gravities of Air and Water, allowing for the great Height of the Atmosphere: Of which more elsewhere.

PARADOX V.

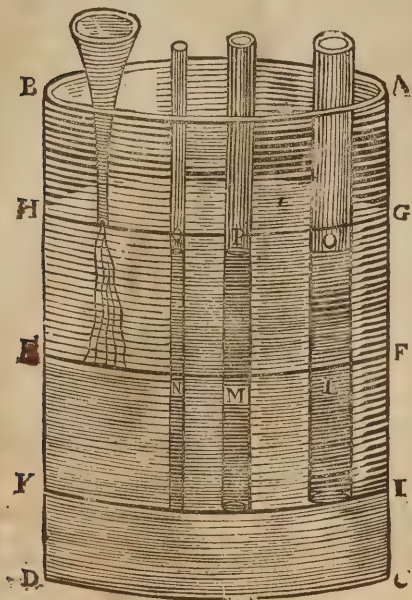
That the Pressure of an External Fluid, is able to keep an Heterogeneous Liquor suspended at the same Height in several Pipes, though they be of different Diameters.

Take a pretty wide-mouth'd Glass, (as in Fig. 5. following) of a convenient Depth, and put into it a sufficient Quantity of Water well tinged with Brazil, &c. then fit to it a Cover of Cork, through which bore, with a red-hot taper Iron, several round Holes, to admit Tubes of different Bignesses or Sizes. Let these Tubes stand nearly upright in the Vessel, and reach all with their lower Orifices below the Surface of the Water: Then at an Hole purpose-

purposely left for it, pour in gently, by a Glafs Funnel, a good Quantity of Oil of Turpentine, and you will plainly see the tinged Water rise equally, (*i. e.* to equal Heights) in all the Tubes, tho' of very different Bores and Sizes.

The Reason of which will thus appear.

Let *EF* represent the Surface of the Water in the Vessel; when the Oil comes to be poured upon it, not being of a Nature fit to mingle or incorpo-

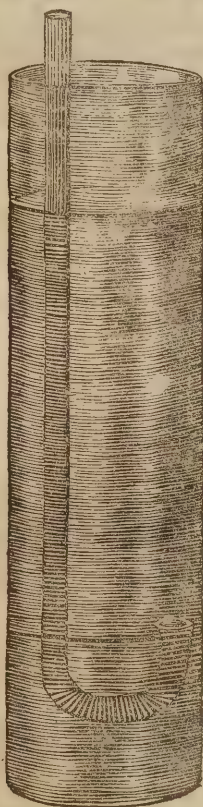


rate with it, it will swim at the Top, and with an equal Gravity press upon all Parts of the Surface of the Water, and consequently will raise or press up the Water in the Tubes, till it come near to the same Height in them, as the Oil is at in the Glafs, to bring the Liquors to a Balance. But there is no Reason why the Water should be raised to a greater Height in any one Tube than in another; because the Oil presses uniformly and equally on all Parts of the Surface of the Water; and consequently can force up the Water no higher in the smallest Tube than in the greatest; for should it do so, the Water in the small Tube must be of a larger Length than the corresponding Column of Oil (whose Diameter is equal to the Orifice of that Tube, and which keeps it up by equi-ponderating with it) doth require: But then it must be heavier than it, and so would sink down, and drive the subjacent Water away to make room for its Descent: Wherefore no Cylinder of Water in any Tube, can be higher than an equal Cylinder of Oil that bears or buoys it up; and this being the Case with them all, they must be all of the same Height; that is, the Water will rise as high in one Tube as in another, be their Bores never so different; and the Reason is, because each one is born up by a corresponding Column or Cylinder of Oil, whose Diameter is the same with that of the Orifice of the Tube.

PARADOX VI.

If a Body be placed under Water, with its uppermost Surface parallel to the Horizon, the direct Pressure which it sustains, is no more than that of a Column of Water, having the Horizontal Superficies of the Body for its Base, and the Perpendicular Depth of the Water for its Height. And if the Water that leans on the Body be contained in Pipes open at both Ends, the Pressure of the Water is to be estimated by the Weight of a Pillar of Water, whose Base is equal to the lower Orifice of the Pipe, and its Height equal to a Perpendicular reaching from thence to the Top of the Water; though the Pipe be much inclined any way, or though it be never so irregularly shaped; and much broader in some other Places than at the Bottom.

Take a slender Glafs Pipe of an even Bore, turned up at one End like this in the Figure; dip this Tube (open at both Ends) into Oil of Turpentine,



till the Liquor be risen up to two or three Inches in the longer Leg, whose upper Orifice then stop with your Finger; and then remove the Tube into a Glafs of Water, and hold it so that the Surface of the Oil in the longer Leg of the Pipe be but a very little higher than that of the Water: And then, if you take away your Finger that stopp the Pipe, you will see the Oil will keep its station, and not at all, or at least but very little, rise or fall; but if you sink the Tube lower, the Oil will rise; if

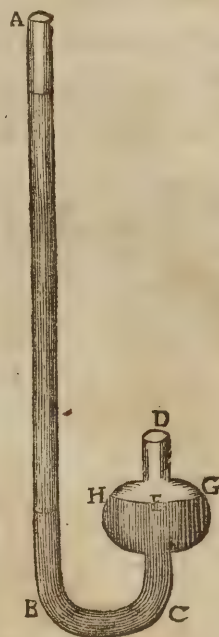
if you raise the Tube higher, the Oil will run out at the lower End: From whence it appears, That of all the Water in the Glass, no more pressed on the Orifice of the Pipe, than a Cylinder equal to it in Diameter, and in Length equal to the Distance between the Orifice of the Pipe and the Top of the Water (as you may also easily find if you make a Siphon, whose shorter Leg shall be long enough to contain such a Cylinder of Water as will counterpoise the Oil in the longer.) For when, by raising up the Pipe, you shorten that Cylinder, the Oil will run out: As when by sinking it lower, and so lengthening the Cylinder of Water, the Oil will be forced up higher into the longer Leg of the Tube.

You will find also by Experiment, That this Paradox will hold, whatever be the Figure of the shorter Leg of the Tube, whether opening broad like a Tunnel by Degrees, or whether it have a Spherical, or otherwise figured Cavity of considerable Dimensions in the Middle of it.

For our Noble Author found, by providing a Syphon of the Figure annexed, and pouring in Mercury till it reached up to the Bottom of the Globular Part of the shorter Leg, and to an equal Height in the longer Leg of the Syphon; he found, I say, that if he poured Water in at the Top of the longer Leg, it would drive up the Mercury into the Ball of the shorter Leg, and more than half fill its Cavity; (which it would have filled quite, had the other Leg been long enough.) And that this Ball in the Middle of the shorter Leg, though it held a great Weight of that heavy fluid Mercury, did no more hinder the Mercury from rising to its due Height, according to the different Specifick Gravity of those two Liquors, Water and Mercury, than if the shorter Leg had been every where of the same Dimensions with its upper Orifice *D*: For the great Quantity of Mercury which was forced up into the Ball,

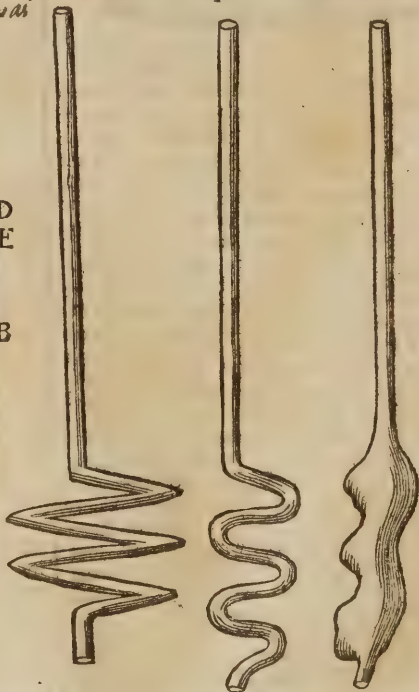
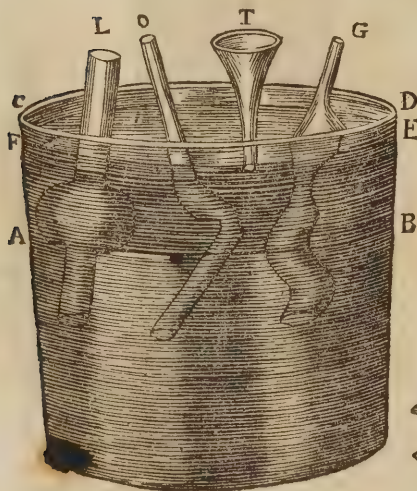
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was there, in a good Measure, supported by the Bottom and Sides of it, and no more gravitated on *C*, than what lay perpendicularly over it between *B* and *C*.



And farther, to make out the latter Part of this Paradox, he took three Glass Pipes, *L*, *O*, *G*, of such irregular Shapes as the Figure adjoining shew-

eth



-eth; and these, by Holes purposely made for them in a Covert of Cork, he placed obliquely within a Glass Vessel filled with Water up to *AB*. Then by the help of the Tunnel *T*, he gently poured in

Oil of Turpentine, till its upper Surface reached to *FE*; which Oil he found did, by its Pressure on the Surface of the Water, raise it up to an equal Height in all the three Pipes.

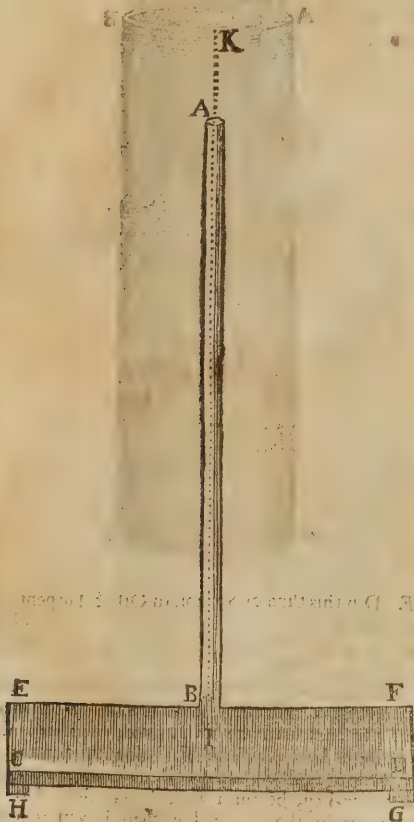
SCHO-

IN SCHOLIUM.

is in a Cylindrical, or otherwise Figured Vessel, have, by a Hole made in its Cover or Lid, a Pipe of any length fastened there, and the Vessel by that Pipe be filled with Water, as also the Pipe it self; the Basis of that Vessel doth sustain a Pressure equal to that of a Column of Water, whose Base is the same with the Bottom of the Vessel, and its Height that of the Vessel, Pipe and all.

This Paradox *Stevinus* adds by way of Appendix to the last; but the ways he proposes to Experiment its Truth, are not such as will answer trial; and therefore Mr. *Boyle* devised the following Experiment, which (though not so accurate as some other) doth yet very well deserve to be considered.

He ordered a Tin or Laton Vessel to be made of the adjoining Shape, which had a loose Bottom,



CD, made of a flat Piece of Wood, covered with a soft Piece of Bladder, and greased on the lower Side near the Edges, that so leaning on the Rim of Wood *GH*, contiguous every where to the Inside of the Laton, it might easily be lifted off from it, and yet lie so close upon it at other times, that the Water should not get between them. To the Middle of the loose Bottom was fastened a long String, that came up through the Body of the Pipe *AB*.

The Instrument thus fitted, there was Water poured in at *A*, which pressed against the false Bottom *CD*, and kept it so tight down, that no Water ran out. When the Vessel and Pipe were both

filled with Water, the upper End of the String *KY* was fastened to the Beam of a good Pair of Scales, and then as much Weight was put into the opposite Scale, as did lift up the false Bottom, *CD*, from the Rim *GH*, and so let out the Water; and this Weight he found to be very considerably more than what would have served to lift up as much Water as that Vessel did contain, had it been in an open one of the common Shape: But he neither tells us the Measure of the Vessel, the Height of the Tube, nor the Weight which was required to raise the Bottom; which if he had done, 'twere very easy to have calculated the Quantity and Weight of a Column of Water, which should have had the Bottom for its Base, and the united Length of Tube and Vessel for its Altitude.

This Paradox, in the *Memoirs Mathematiques 69 de Physique*, A.D. 1692. P. 12. is thus stated by Mr. *Varignon*.

If there be two Tubes or Vessels, having the same Heights and Bases, both filled with Water, but one of them made so tapering upwards, that it shall contain but 20 Ounces of Water, whereas the other holds 200; the Bottoms of the two Tubes shall sustain an equal Pressure of Water, viz. each of them that of the Weight of 200 Ounces, the Quantity of the Liquid contained in the greater Tube.

This is undoubted Fact, and agreed upon by all to be true, as long as the contained Liquor continues Fluid; but if it should freeze, then it will by no means hold, the lesser Quantity of Ice (to be sure) being much lighter than the greater.

This Reason therefore of this surprising Phenomenon seems to depend much on the Nature of Fluidity; and accordingly Mr. *Varignon* espouses the Opinion of those who assert, That the 20 Ounces of Water in the tapering, or otherwise unequally form'd Tube, as long as the Water continues liquid, do press and effectively charge the Bottom of the Vessel, as much as 200 Ounces would do in a uniform Cylindrical Tube of the same Base and Altitude.

Others say the straitened Sides of the unequal Tube, by hindering the rising of the Water, do help to sustain the Weight; and that the Bottom alone is not charged with the whole Pressure, but a good Part of it taken off by the Sides.

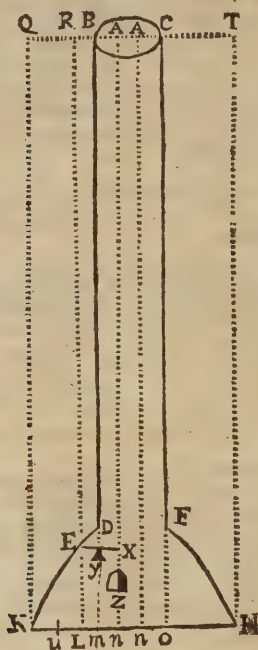
Mr. *Varignon* thinks the Matter easily solvable in the former way, thus:

The Tube *BACFHKEDB*. (See the following Figure) having its bottom Part *DKHF* much larger than its upper Shank *BCFD*; I say, hath its Bottom *KH* charged with as great a Weight or Pressure of Water, as if it were a Cylindrical Vessel, as *QTHK*, of the same Base and Altitude with the unequally shaped Tube.

Draw the Lines, as you see in the Figure, so shall *QV* represent a Column of Water in the supposed truly Cylindrical Vessel, having the Diameter of its Base double to that of *RL*, *BM*, or *AO*.

Then will the Column of Water *BN*, bearing upon the Arm *MN* of the Libra *LN*, whose *Hypomochlion* is imagined to be at *M*, be a Counterbalance to the Column of Water *EM*, which is kept down from ascending any higher by the Side of the Vessel *EL*, just as the Weight at *Z*, at the End *X*, of the Libra *EX*, whose *Hypomochlion* is at *Y*, is balanced by the Side of the Vessel *ED*, which hinders the Arm *ET* from ascending. Now *ET* being = *YX*, the Weight sustained by the *Hypomochlion*

hypomochlion at T , is double to that at Z ; wherefore the subjacent Point M , or that part of the Bottom of the Vessel LN , must be charged with double the Weight of the Column of Water BN ; or which is all one, will be pressed with the Weight of the Column of Water RN , which may be supposed to reach quite up to the Top.



Let us then take $ANLKED$, as equivalent to such a Column; then will that Water be a Balance on the *Hypomochlion* L , to the Water leaning on the other Arm of the *Libra* KL , and kept down by the Side of the Vessel KE ; and consequently, the part of the Bottom KN , will sustain a Pressure equal to that of the Column of Water QN ; for this, by the above-mention'd way of arguing, is the same as that of the Water contained in the Space $ANKDB$.

And thus, on the other Side, it may be proved, That the remaining part of the Bottom NH , is pressed upon by the Water $ANHFC$, equivalent to the Weight of the Column of Water TN , reaching up to the Top.

From whence it follows plainly, That the Water in the Tube $BDKHFC$, presses or gravitates on the Bottom equally with the Weight of the Cylindrical Column $QTHK$, having an equal Base with it.

All which Method of Arguing, will be clear enough to one that considers 'tis the Property of all Fluids, from the known Laws of *Hydrostatics*, to have their infinitely small Columns, of which they consist, to be every where a Balance to one another.

PARADOX VII.

That a Body immersed in a Fluid, sustains a lateral Pressure from the Fluid; which also increaseth as the Body is placed deeper beneath the Surface of the Fluid.

Take a slender Glass Tube, and let it be bent so near the Bottom, that the lower Part FG may very nearly make a Right Angle with the other Part



EF . Dip this Pipe or Syphon in Oil of Turpentine, and take up about 3 or 4 Inches of it in the Pipe, which you may keep there by applying your Finger to the upper Orifice.

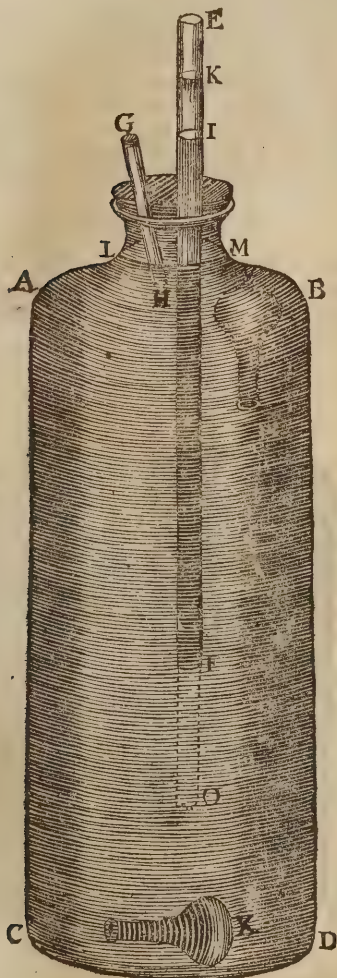
This done, move the Syphon into a Glass of Water, and place it so there, that the longer Leg may stand perpendicularly to its Surface, and that the other lower Leg may be so far below the Surface of the Water, as that the upper Surface of the Oil in the longer Leg, be but a little higher than that of the Water in the Glass: For then if you remove your Finger from the Top, the Oil in the Tube will very little, if at all, change its Station; which shews plainly, that there is a lateral Pressure against the Oil at the lower Orifice G , which hinders its running out, though pressed by the Cylinder of Oil contained in the perpendicular Leg. And as if you raise the Pipe up higher (keeping it still in its perpendicular Posture) the Oil will drop out; so if you sink it lower, the Water will get in at G , and force the Oil all out of that Leg $G F$, and raise the Oil proportionably in the perpendicular one EF : Nay, if you thrust it low enough, the Water will rise up into the longer Leg, and bear the Oil above it; which last Circumstance proves, That Water hath a lateral

a lateral Pressure against it self; as great as the perpendicular one from above, since that only can force the Water up into the perpendicular Leg.

If also keeping the Tube at the same Depth, you turn the Horizontal Leg here and there, or place its Orifice *G* in any Part of the imaginary Plane *FG*, the Oil will keep its former Station in the Tube, and neither rise nor sink; which shews, That this lateral Pressure is equable and uniform in all Places or Parts of a Vessel of Water, at the same Distance from its Surface.

Our Noble Author confirms the Truth of this Paradox by the following Experiment:

A small Glass Bubble *X*, of the Figure in the Scheme annexed, with a very slender Neck, and so well poised, as that it could just float in the Water,



and no more, being provided, was put into a wide-mouth'd Glass Vessel, near filled with Water, and there left to float at the Surface of that Liquor. Then a Cover or Stopple of Cork was well fitted to the Mouth of the Glass, and was thrust hard into it; after which there was an Hole burnt (with a hot Iron) thro' the middle of the Cork, into which was put a long slender Glass Pipe, reaching a good

way into the Glass, and standing perpendicularly to the Surface of the Cork.

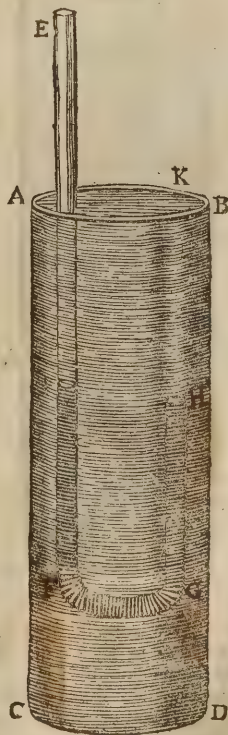
Also in another Part of the Stopple was another small Hole burnt, and into that was fitted another small Glass Tube, which lay sloping; but yet reached a pretty way down below the Cork.

The upper Orifice of this sloping Tube was well stopp'd with Cement: With the same Matter also were all the Junctures between the Cork and the Glass, and between the Tubes and the Cork, carefully stopp'd.

This all done, the Vessel was inclined several ways, that the Bubble *X* might get as far as it could from the Pipe; and then more Water being poured in at the upper Orifice of the open Pipe *EE*, till it reached to a good Height, as suppose to *K* in the said Tube, the Bubble *X* would presently sink to the Bottom of the Vessel, and there continue as long as the Water was continued at the same Height in the Tube *EF* (the reason of which you have already in *Experiment 2. Paradox 2.*) Now this proves, That the Pressure of the Water contained in the Tube *EF*, doth not only affect the Parts of the Water immediately subjacent to it, but also those that are remote from it; nay, and above it, since it could force the Water into the Bubble *X*, and so make it sink, tho' it lay not near the Orifice *F* of the open Tube.

PARADOX VIII.

That Water may be made to depress a Body lighter than it self, as well as to buoy it up.

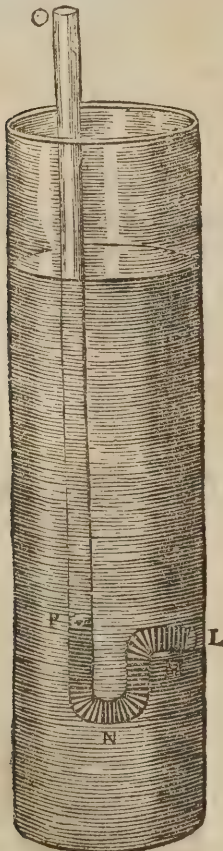


A slender Glass Syphon *EF GH*, whose shorter Leg *GH* was about 3 or 4 Inches long, and turn'd up

up as near as could be parallel to the longer *EF*, was dipp'd in Oil of Turpentine, till the Oil filled the shorter Leg, and rose to an equal Height in the longer.

Then the Orifice *E* being stop'd with the Finger, the Pipe was moved into a Glass Vessel of fair Water, and sunk down there till the Surface of that Liquor was about an half Inch above the Surface of the Oil in the Syphon: And then the Finger being removed from the Top, the Oil in the shorter Leg was immediately driven downwards about an Inch; and as the Tube was sunk lower, much more, till at last the Oil was driven out of that Leg quite, and the Water following it supported the Oil in the longer Leg, raising it also in the same Proportion. The reason of which is obvious from what hath been said in the former Paradoxes.

Our Author found also, that when he used a Syphon of the Figure annexed, the Water would



first press the Oil Horizontally from *L* to *M*, then downwards from *M* to *N*, and at last (by sinking the Tube still lower) upwards from *N* to *P*: From whence it appears, that Water presses against any Body placed in it all manner of Ways, and that proportionably to the Depth of the Body in it.

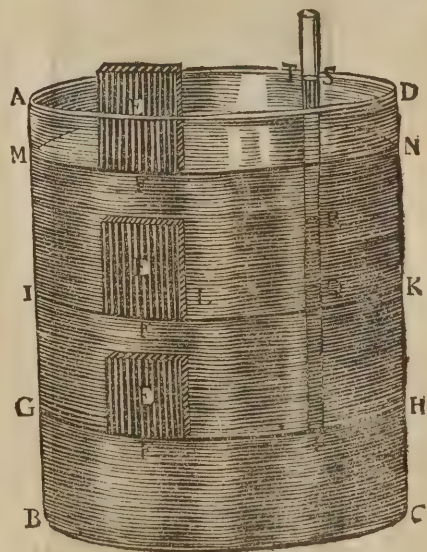
PARADOX IX.

That whatever hath been said of Positive Levity, a Parcel of Oil, lighter than Water, may be kept in that Liquor without ascending in it.

This may very easily be experimented, by taking only a small Glass Tube, and immersing it an Inch or two under Water: Stop the upper Orifice with the Pulp of your Finger, and then a Column of Water of an Inch or two in length will remain suspended in the Tube: Keep it so, and next dip the same Tube into a Vessel of Oil of Turpentine, and removing your Finger, as much Oil of Turpentine as you please will rise into the Tube; which, by putting on your Finger to the upper Orifice, may be there easily suspended, as the Water was before. Keep it so, and then immerse the Tube in a Glass of Water 3 or 4 Inches beneath its Surface, and you will find on the removal of your Finger, that the Water will rise up into the Tube, and keep the parcel of Oil suspended between two little Columns of Water. The Reason of which is sufficiently accountable from many things already delivered.

PARADOX X.

That the Cause of the Ascension of Water in Syphons, and its flowing thro' them, may be explicated without having recourse to Nature's Abhorrence of a Vacuum.



Provide a pretty large Cylindrical Glass Tube Vessel of about 18 Inches, or two Foot long, as *ABCD*; provide also a Syphon of two Legs, *KF* and *KG*, with a hollow Pipe, as *KE*, opening into, or communicating with them; to each of these two Legs of the Syphon (one of which must be longer than the other) tie with a String a Tube of Glass *I* and *H*, sealed at the Bottom. Pour then in Water at *E*, and let it run out at *I* and *H*, till it hath filled the Tubes hanging at the Ends of

the Legs of the Syphon so far, that the End of each Leg be a little beneath the Surface of the Water.

This done, and the Pipe and Syphon fastened in its true erect Position, if you fill the Vessel *ABCD* with Oil of Turpentine, till it reach higher than the Syphon *K*, stopping in the mean time, if you please, the upper Orifice of the Pipe *EK* with your Finger.

After this you will find the Oil to press so on the Water in the Tubes *I* and *H*, as to force it up into the Legs of the Syphon as high as *K*; and that on the removing of your Finger from the Top *E*, the Water will begin to run out of the upper Tube *I* into the lower one *H*, as in or thro' a common Syphon or Crane.



Now 'tis plain, in this ingeniously contrived Experiment, that the Water runs through the Legs of the Syphon, tho' the Air coming down by *EK*, hath a free Communication with them both, so that here no *fuga Vacui* can be pretended as the Cause of the Waters running; but that 'tis plainly occasioned by the Pressure of the (lighter Fluid)

Oil of Turpentine, on the Surface of the Water in the Tube *I*, till it force it up into the empty Leg of the inserted Syphon as high as *K*, and then it descends down into the lower Vessel or Tube *H*, thro' the other longer Leg of the Syphon. Indeed the Oil will gravitate on the Surface of the Water in both the Tubes *I* and *H*; and there being a longer Column of Oil over *H*, than there is over *I*, by about an Inch in length, the Pressure will be greater on the Surface of the Water in *H*, by the Weight of an Inch of Oil of Turpentine. But then it must be considered, that the Column of Water which descends in the Leg *G*, though resisted in its motion by the Weight of an Inch of Oil, more than the Water which tends downwards in the Leg *F*, is yet also longer by an Inch than the other Column of Water in the shorter Leg *F*; and an Inch of Water of the same Dimensions being heavier than an Inch of Oil, the Tendency or Motion of the Water must be from *F* towards *G*, not from *G* towards *F*; and consequently the Syphon will work or run that way.

The Application of this Experiment to the Solution of the Motion of Water through Cranes or Syphons is very easy:

For when once a Syphon, by Suction or otherwise, is filled with the Liquor 'tis to transmit; if the Legs of it be not above 34 or 35 Foot in length, and one of them be longer than the other, the Liquor must continue to run thro' it as long as there is any to rise in it, or that the Syphon hold stanch: For since the Pressure or Weight of the incumbent Atmosphere is capable of raising Water in Pipes (where it cannot come to press) to the Height of 34 or 35 Feet, as our Noble Virtuoso proves in his *Physico-Mechanical Experiments*; and here being manifestly no Gravitation of the Air on the Water included in the Syphon, as long as the Syphon is right and stanch, the Water must continue to keep running, because the Difference of the Pressure of the Air on the lower Vessel of Water, and on the upper, being nothing near so considerable as the Difference between the Weight of the Water in the longer Leg of the Syphon, and that in the shorter, the Tendency or Motion must be out of the shorter into the larger.

But then, if never so little an Hole be made in the Crane or Syphon, or any Leak be there, the Water can no longer run, because the Air now comes to press on the Water within the Syphon, as well as on that without it, and consequently must hinder it's Course of running.

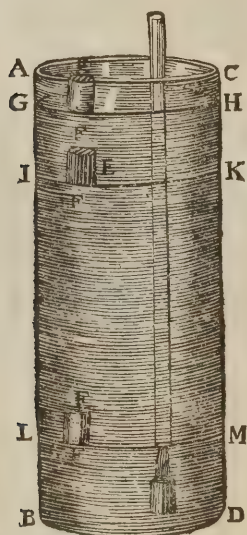
PARADOX XI.

That a Solid Body, as ponderous as any known, tho' on the Surface of the Water it will sink by its own Weight; yet if it be placed in a greater Depth than that of 20 Times its own Thickness, it will not sink, if its Descent be not assisted by the Weight of the incumbent Water.

Fill a deep Glas Vessel, of about 2 or 3 Feet in length (a large Tube, sealed at the End, will do very well) with Water, as in the Figure: If then a little Cylinder or Cube of solid Brass, as *E*, be any where placed, either at the Surface, Middle, or towards the Bottom of the Vessel, still it must sink to the Bottom, because the compound Column of Water and Brass together (which Brass is almost

most 9 times as heavy as common Water) will gravitate or press more than any Column of Water only of the same Length and Diameter ; and consequently the Brass will displace the Water under it, and sink lower and lower till it come to the Bottom ; and this is the Case of a Stone, or any other heavy Body, &c. But yet, if you suppose this Piece of Brass placed on the imaginary Surface *LM*, above 9 times its depth under Water, and that it were possible to keep off the Pressure of the Water perpendicularly incumbent upon it, it is not reasonable to suppose, That the Brass should sink at all, but be supported and buoyed up there : For the Brass can in this Case charge the Water under it at *F*, with no more than just its own proper and absolute Weight ; whereas all the other Parts of the Surface *LM*, are charged or pressed upon by Columns of Water, which, supposing them to be of the same Diameter with the Piece of Brass, or singly heavier than the Brass, because they are above 9 times as long as the Brass is thick ; and therefore press-

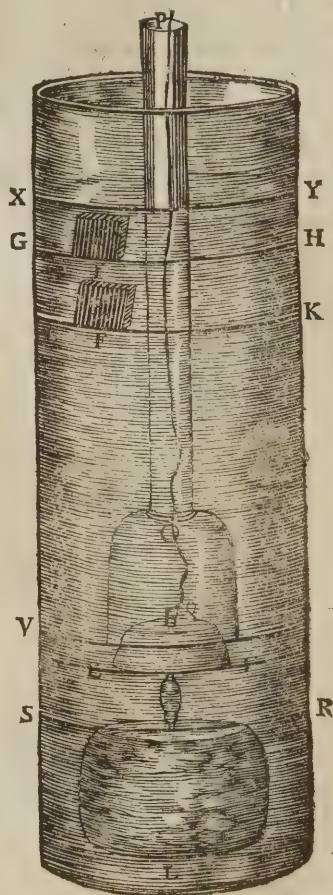
which, tho' it would stop the Valve exactly, would yet easily fall out, if not suspended or supported by



ing or gravitating more on *LM* than the Brass doth, must keep the Brass suspended ; which cannot sink, because it cannot remove a Weight of Water heavier than it self. And from the same Principles 'tis plain from Reason, That if the Brass be placed yet lower, and the Pressure of the incumbent Water be, as before, taken off, instead of sinking, it must needs rise, and be forcibly lifted upward. This also must be the Case of a Piece of Gold, if it were placed in these Circumstances, in a Vessel of Water, where the perpendicularly incumbent Pressure was kept off, and the Gold above 19 Times its own Thickness in the Liquor.

To make good which probable Reasoning by Experiment, our Author proceeded thus :

A large deep Glass Vessel was provided, of the Figure annexed, which was filled with Water near to the Top, as to *XY* : Then at the Bottom of a Glass Tube, open at both Ends, there was, by good Cement, fastened a Brass Valve, into which was turned and fitted a Piece of solid Brass *EF*,



any thing : To the upper Side of this Brass Piece *EF* let there be a Button fastened, whereby it may, by means of a String coming up through the Pipe *PO*, be drawn up close, so as to stop the Valve.

All things being thus-fitted, if you sink the Tube with its Valve and Brass Stopple, and by the String keep the Stopple fast in, till the Brass be about 9 times its Thickness beneath the Surface of the Water in the Glass Vessel, you will find, tho' you loosen the String, that the Brass Stopple will not fall out ; because the Valve being close, and the Sides of the Glass Tube not capable of being premeated by the Water, there can no more of that Liquor press upon the Brass Stopple perpendicularly ; but whatever Pressure it sustains, is from the Tendency of the Water upwards, which must needs serve to support it, since that is greater than the Weight of the Brass. But if you raise the Tube up towards the Top of the Water, the Brass Weight over-balancing there the Pressure of the Water upward, it will soon, if not held by the String, slip out of the Valve and fall down, and the Water will immediately rise in the Tube.

And if, instead of raising the Tube up towards the Surface of the Water *XY*, you should sink it down much deeper toward the Bottom, you will find that

that this Brafs Stopple, which will fall out readily in the former Station, will now support a considerable Weight (as *Z*) fastened to it by a Bottom made on the under Surface of it; but that on the raising of the Tube upward, this additional Weight will make the Stopple drop out much sooner than before: As suppose, when the Tube is raised only to the Height of 3 or 4 Inches, &c. which Experiments do abundantly confirm the Truth of this Paradox; and no doubt can be made, but that if a Gold Stopple had been used instead of a Brafs one, and the Tube let down into the Vessel, till the Gold had been above 19 times its Thickness under Water, even that ponderous Metal would have there remained without sinking.

N. B. This Experiment may most readily and easily be tried (as I have often done my self) with Mercury: If you take a slender Glass Tube or Pipe, of about $\frac{1}{2}$ of an Inch Bore, or rather less, and dipping the lower End into a Vessel of Mercury, you then stop the upper End with your Finger, by which means you may keep half an Inch, more or less, of that ponderous Fluid suspended in the Pipe; and then if, keeping your Finger thus, you immerse the Tube into a long Glass of Water, till the little Column of Mercury be more than 13. or 14 times its length under Water, you will find on removing your Finger, that the Mercury will be kept suspended in the Tube by the Pressure of the Water upwards; but that if you raise the Tube up but a very little above the former Station, the Mercury will immediately run out: Whereas, if before you had removed your Finger from the Top, you had sunk the Pipe so low, as that the Mercury were 12 or 14 Inches, $\frac{2}{3}$ below the Surface of the Water, that then the Mercury would be violently forced up, and make several Ascents and Descents in the Tube, till by degrees it had gained its proper Station in it, according to the Laws of Specific Gravity.

Indeed this Experiment will not be of a very long Continuance, because the Water will by degrees get up between the Mercury and the Sides of the Tube; but it will last a few Minutes, and longer if the Tube be very slender, which is time enough to satisfy any one of the Truth of this Paradox.

From hence may the Adhesion of the two polished Marbles together, when the upper is suspended, and a great Weight hung to the latter, be easily accounted for: For since the Atmosphere presses or gravitates with its whole Weight on the under Surface and Sides of the lower Marble, but cannot do so at all on its upper Surface, which is closely contiguous to the upper and suspended Marble, it must needs keep the Stone buoyed up or pendulous, 'till such time as either the Air insinuate it self in between the Stones, or that a Weight be affixed to the lower Stone, which exceeds the Weight of a Pillar of Air, whose Diameter is that of the Marble, and its Height reaching to the Top of the Atmosphere: And that this is the reason of their Cohesion, is plain, because when they are thus suspended, and do adhere to each other in the Receiver of the Air Pump, on a very few Pumpings of the Air out of the Receiver, they will immediately disjoin and fall asunder.

Thus far went this Excellent Gentleman; But that the Mathematical Reader may also be pleased in his way too, he has the following short Account of

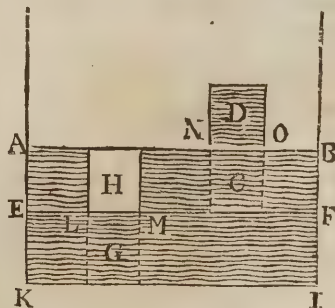
Hydrostaticks, drawn up from Dr. Wallis and some other Authors.

PROP. I.

Let the Vessel *ARIB* be fill'd with Water, or any other Fluid, whose Surface we suppose to be even; (which, though in reality it will not be a Plane, but part of the Surface of a Sphere concentric with the Earth; yet we shall all along consider it as a Plane, or as differing insensib'y from one;) I say, if this Surface be supposed even at first, 'twill still remain so.

Which is thus demonstrated :

Let the even Surface AB of the Vessel $AKIB$ (See Fig. 1.) be either not pressed at all, or else pressed equally in every Part, as will be the Case, allowing the Pressure of the Air, which is an Homogeneous Body with respect to Gravity, and presses equally in all the Parts of so small a Surface. Now since the Parts of the Fluid below are all acted upon by Gravitation, they cannot ascend, and so elevate any part of the Surface AB ; nor can the Fluid subside in one part, and so be elevated in another, being the Pressure against the Bottom is every where equal, and consequently hinders one another's Subsidence, supposing the Fluid divided into any number of equal Columns: Hence it follows, from the contrary Pressure of these equal Columns at the Bottom of the Vessel, that there can be no Motion; that is, the Surface will remain even without any manner of Disturbance. *Q. E. D. See Dr. Wallis's Mecha. Prop. 8. Cap. 2. de descensu gravium.*



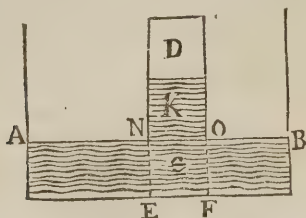
But if the Fluid be put out of this State by some external Force, so that one part of it, as *D* (Fig. 1.) be elevated above the rest, do but remove the Force, and it will return to its former Horizontal Position, partly upon the Account of its Fluidity; the Parts above flowing down into those Places that are below them, and also because the subjected Part *C* being more prest than the other Parts of the Surface *AB*, this Pressure will be continued to the Bottom of the Vessel; where, by reason of the resistance made by the Bottom, it will be communicated to those Parts that are less prest, forcing them to ascend so long till the *Equilibrium* be again restored, *i. e.* till *AB* become even and parallel to the Horizon: So that altho' the Surface be not a Plane, as it was supposed in the foregoing Proposition, yet if the force be removed that made its Surface unequal, it will again recover its former State.

There

There may be some Accidental Variations which we shall not at present consider, as that the Parts of the Fluid may happen to be tenacious, &c.

If the Fluid be pressed more in one part than another, as in *C*, by reason of the incumbent Body *D* (Fig. 1.) (which Body is supposed to be specifically heavier than Air) then will the part of the Fluid *C* subside, forcing the other Parts of *AB* to rise, in order to make way for it; and this will happen till such time as *C* is no more pressed than any other Parts of the Surface *AB*.

And what we have said of *AB* is equally true of any parallel Surface with the Fluid; as of *EF*, whose Surface is Horizontal, and will remain so, the Pressure being every where equal: But if the immersed Body *H* be specifically heavier than the Fluid, the subjected Part *G*, as sustaining a greater Weight, will be depreſt, forcing the Fluid to rise in the parts about *EL* and *MF*, which parts have a less Pressure upon them than the part *LM*.

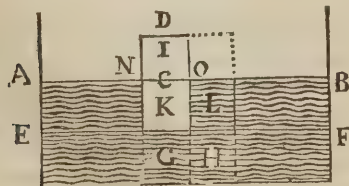


COROLLARY I.

Fig. 1. If the Body *D* be precisely as heavy as so much Air equal to it in Bulk, then will *NO*, that Portion of the Surface which *D* insits upon, have the same Pressure upon it with *AN* and *OB*; and consequently the Surface will retain its Horizontal Position, as having still every where an equal Pressure upon it.

COROLLARY II.

If the Body *D* (Fig. 2.) be specifically lighter than Air, and if it be supposed not to fly away, then will that part of the Fluid it insits upon, be less pressed than *AN* and *OB*, and consequently will rise so high, till *K* and *D* together be equal in Weight to that Column of Air whose Room they possess; for then, and not till then, the Pressure upon *ANOB* will be equal.



COROLLARY III.

If the Body *D* (Fig. 3.) be specifically heavier than Air, but lighter than Water, it will then depreſt that part of the Fluid that is under it, and subſide ſo far into the Water (suppoſe to *G*) until the Gravity of that part of it which is above the Surface of the Water, viz. *I* bears the same Proporti-

on to as much Air as equals it in Bulk: As the Gravity of as much Water as is in Bulk equal to *K*, (viz. *I*) bears to the Gravity of the immerſed part *G*. To illustrate which, put *G* for the Gravity of *I*, *g* for the Gravity of an equal Portion of Air, *M* for the Gravity of *K*, and *m* for the Gravity of *L*; then, before the parallel Surface *EF* can have an equal Pressure upon it, *GM* must be equal to *gm*, (i. e.) $G : g :: m : M$.

COROLLARY IV.

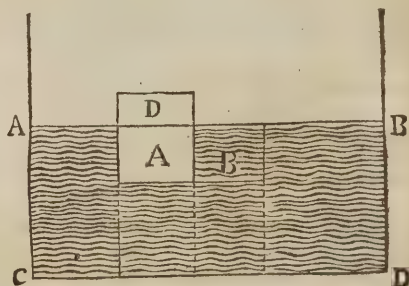
If *D* or *H* (Fig. 1.) be, Bulk for Bulk, heavier than Water, then will *C* and *G*, the Parts they insit upon, have a greater Pressure upon them than the other Parts of the two Surfaces *AB* and *EF*; and this will be every where true, so that *D* or *H* must sink to the Bottom of the Vessel *KL*.

COROLLARY V.

If *D* (Fig. 1.) be precisely as heavy as Air, then (by Cor. 1.) it will insit upon the Surface without subſiding at all; for it will be the same thing as if so much Air preſt in the room of it: But if it be specifically as heavy as the Fluid it is immersed in, then where ever it be placed within the Fluid, there it will remain; for as to Gravitation, there will be no Difference between the Fluid and it.

PROP. II.

If *A* be a Body specifically lighter than *B* (Fig. 4.) an equal Portion of the Fluid (in which it is immersed) then will it rise with a Force proportionable to the Exceſs of Gravity of *B* + above *A*.



Demonstration.

For the Gravity of *A* put x ; for that of *B*, $x + y$ (y representing the Exceſs of Gravity of *B* above *A*) then take a Body, as *D*, with the Gravity y , and let *D* + *A* be immersed in the Vessel *ABCD*, and it will subſide ſo far, till $x + y : x :: y : x$ is to the Gravity of a Quantity of Air equal to *D*, (which, because 'tis very inconsiderable, may be neglected) or till *B*, a Quantity of Water equal in Bulk to the immerſed part *A*, shall be equal in Gravity to the whole *D* + *A*: But a Quantity of Water, equal in Bulk to *A*, shall (by the Suppoſition) have its Gravity equal to the Gravity of *D* + *A*; therefore *A* is the part immerſed.

From this Equilibrium it is evident, That the Force with which *A* preſſes upwards, is equal to the Gravity of *D* downwards; but the Gravity of *D* is equal to the Exceſs of Gravity of *B* above *A*; therefore

H Y D

therefore *A* ascends with a Force proportionable to the Excess of Gravity of *B* above *A*. *Q. E. D.*

P R O P. III.

If the Body *A* (Fig. 4.) be supposed heavier than *B*, (an equal Portion of the Fluid in which it is immersed) it gravitates with the Excess only of its Gravity above that of *B*.

Demonstration.

Let the Gravity of *B* be $= x$, and that of *A* $= x + y$; then these two Forces being directly contrary, x and x destroy one another, so that *A* only gravitates with y , the Gravity by which *A* exceeds *B*. *Q. E. D.*

C O R O L L A R Y.

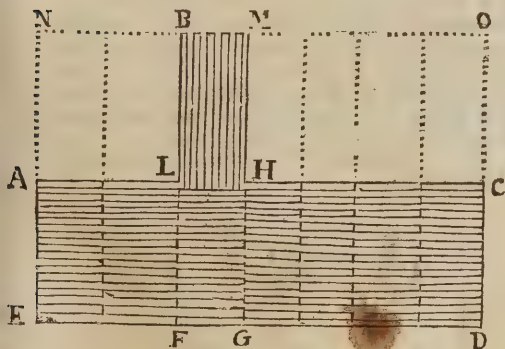
Hence it is manifest, That of Bodies immersed in Water, or any other Fluid, we only perceive the Difference between the Weights of the immersed Body, and of such a Quantity of Water, or any other Fluid, in which the Body is immersed, which is equal to the Bulk of that Body.

P R O P. IV.

All Fluids press upon subjected Bodies according to their perpendicular Altitude, and not according to their Latitude.

Which is thus demonstrated.

Let there be a Vessel *ALBMHCDE* full of Water (Fig. 5.) then because the Column *BF* is heavier (because longer) than *HG*, 'tis certain, that if the Vessel was open at *H*, *GH* would ascend



till such time as the Columns *BF* and *HG* were in an *Equilibrium*; or of an equal Height; but seeing the Vessel at *H* is shut, and consequently hinders *GH* from ascending, the Pressure upwards upon *H* is equal to the Difference of the two Columns *BF* and *HG*, i.e. *BL*. And since all Pressure is reciprocal, i.e. as much as *H* is pressed upwards by the Liquor, so much it presses the Liquor downwards against the Bottom (Action and Reaction being always equal one to another.) If to this Pressure be added the Gravity of *GH*, the Pressure upon the Bottom *G*, will be the same as if it had the entire Column *BF* insisting upon it.

The same may be demonstrated of all the rest of the equal imaginary Columns; and consequently

H Y D

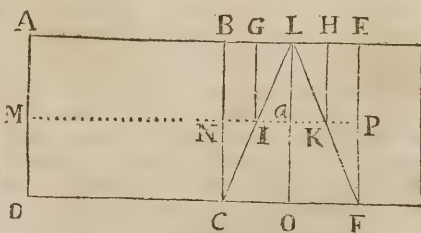
'tis evident, That the Bottom of the Vessel *ED* sustains as great a Pressure, as if *NEOD* were full of Water! *Q. E. D.*

S C H O L I U M, by Mr. Ditton:

The Momenta of Fluids pressing upon any Fund, may be look'd upon as Products; the Quantity of Matter being one of the Factors that compose these Momenta: The other, the *pressive Velocity*, gravitating *Conatus*, or whatever else you please to call it; only remember, that in the following Considerations I shall make use of the Word *pressive Velocity*, as being the fittest I can at present think of.

C A S E I.

In Vessels having equal Altitudes, tho' different Forms, the Momenta will be equal from *Prop. 4.* therefore their Quantity of Matter, and pressive Velocities, will be reciprocally proportional: So in the Cylindrick Vessel *BCFE* (Fig. 6.) and the Conical one *LGE*, the Moments being equal, the Quantity of Matter in the former: will be to the Quantity of Matter in the latter reciprocally: as the pressive Velocity of the whole Fluid in the latter: is to that in the former. But the Ratio of their Quantities of Matter is known from Geometry; therefore the Ratio of their pressive Velocities will be known too.

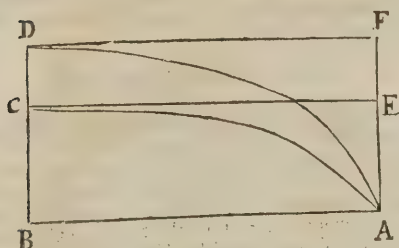


C A S E II.

In the Vessel *LCF*, 'twill be an easy thing to find the Momenta of the Fluid pressing upon the several imaginary parallel Funds, as *CF*, *IK*, &c. for the Momentum of *LCF*: is to the Momentum of *LIK*: as the Momentum of the Cylinder *BCFE*: to the Momentum of the Cylinder *GIKH*. But universally, the Momenta of Cylinders are as their Altitudes, by the last: Therefore let *LCF* be what Figure it will, the Pressure upon a Fund, as *IK*: is to the Pressure upon a Fund, as *CF* in the Vessel continued so far: as the Abscisse *La*: is to the Abscisse *LO*; that is, as $1/a$, to CO : And if you suppose it a parabolick Vessel, as *Laq*, to COq , &c.

N.B. We here consider the Fund *IK*, as making a distinct Vessel, and not merely an imaginary one; so that *LIK* and *LCF* may be considered as two distinct Vessels.

From what is said may be found the Proportion of the pressive Velocities in the Vessels *LCF*, *LIK*; for we know the Ratio of their Momenta, and the Ratio of their Magnitudes; therefore that also of their pressive Velocities, the other Factor of their Momenta, will be known too.



But the Momenta of Vessels of different Heights, having the same common Fund, will be as those Altitudes.

Suppose AD and AC two parabolick Vessels, having the same common Abscissa AB ; then will their Momenta upon the common Fund AB , be as their Ordinates BC and BD , i.e. as the Area's of the two Semi-parabola's ADB and ACB , or in a Sub-duplicate Ratio of their Parameters, as is evident from Conicks.

Likewise in Hyperbolical and Elliptical Vessels, having the same Transverse Diameter and Abscissa common to both, the Pressure upon the common Abscissa, as a Fund, will be as the Area's ACB and ACD of the Semi-Ellipsis and Semi-Hyperbola.

CASE III.

But now we come to consider the Vessels LIK and LCF , (Fig. 6.) as communicating with each other: And here the pressive Velocities will be very different from what they were in the former Supposition: In order to express the Proportions of which, we must consider the Momenta of the several Portions of the Fluid taken from the Vertex, and imagin'd to be cut off by Plains parallel to the Base: And first, the Momentum of the Portion LIK , upon the Fund CF , is equal Momentum of $AMBN$, on the Fund DC ; therefore the Momentum LCF : Is to the Momentum of LIK :: As the Momentum of the Cylinder $ABDC$: To the Momentum of the Cylinder $AMBN$; i.e. as LO , La. But having the Momenta's and Quantities of Matter, we can easily find the other Factors; that is, the pressive Velocities of LCF and LIK , upon the Fund CF ; which may be expressed thus:

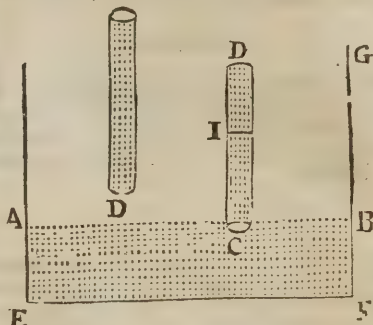
The Ratio of the Momenta's is equal to $\frac{LO}{La}$ and the Ratio of the Magnitudes is equal to $\frac{LCF}{LIK}$; therefore the Ratio of the pressive Velocities will be $\frac{LO \times LIK}{La \times LCF}$.

CASE IV.

To compare together the pressive Velocities in both these distinct Cases, (viz. 2, 3.) 'twill be only necessary to consider, That in the First Case, where we imagin'd a different Fund, as IK , the Momentum of the Portion LIK , is equal to that of the Cylinder $GHIK$; and in the Latter Case, where we suppose all one and the same Vessel, and so the Fluid LIK pressing on the Fund CF , that then the Momentum of that Portion LIK , will be equally the Momentum of the Cylinder $AMBN$; therefore the two Momenta's being as the Cylinders $AMBN$; and $GHIK$, (which have equal Alti-

tudes) will be as MN to IK , i.e. as NP to IK .

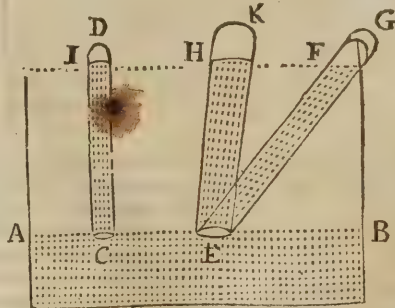
But having the Ratio of the Momenta's, we have also that of the pressive Velocities of one and the same Quantity of the Fluid LIK , when conceived, as pressing upon the Fund IK in one Case, and on the Fund CF in the other.



CASE V.

Let BE (Fig. 8.) be a Vessel fill'd with Mercury to the Altitude AE ; then, as in the way of making the *Torricellian* Experiments, take a pretty long Glass Tube, shut at the End D , but open at C , which fill with Mercury; and stopping the open End C , invert the Tube, and put the said End C into the Mercury BE : 'Tis evident from the first and general Proposition, That if the Mercury contained in the Tube, press more upon C , than the Air upon the other Parts of the Mercury which are expos'd to it; 'tis evident, I say, That the Mercury in the Tube will descend so far, (suppose to D) till the Pressure be equal on all the Parts of the Surface of the Stagnant Mercury in the Vessel: But if the Mercury in the Tube press less upon C , than the external Air does on the Mercury without, then the Mercury within the Tube will ascend so high, till the Pressure of the Mercury within the Tube be equal to that of a Column of Air of the same Diameter in any Part of the Vessel without.

This is clear from *Prop. 1.* and needs no other Demonstration.



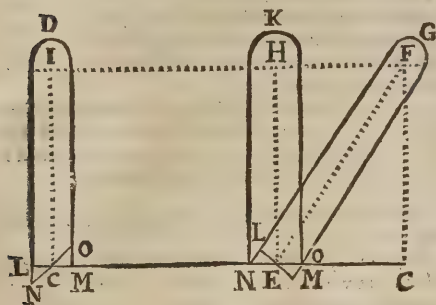
But here it may be enquired, Why, if the erect Tube CI (Fig. 9.) be put in an Oblique Position, as in GE , the Quicksilver should notwithstanding be found at the same perpendicular Height as before; since GE being longer than CI , 'tis certain there must be more Mercury contained in that, than in this.

To this I Answer :

The Figure of the Surface of the Mercury in the Base E of the Tube EG , will become Elliptical, and consequently enlarged by this Oblique Position; for tho' it will be of the same Breadth still, yet it will be so much longer, as is the Ratio of the Diameter E , to the Diameter C : *i. e.* as the Transverse Axe of that Ellipsis to its conjugate.

But I shall demonstrate, That the Diameter of the Base C : Is to the Transverse of the Base E :: As the Length of the Tube CI : Is to the Length of the Tube EF .

For suppose LCM the Base of the erect Cylinder CD , which will be a Circle; and NCO the Base of it cut Obliquely, which will be an Ellipsis.



Then let the Cylinder CD be reclined into the Position EG , so that NCO may become NEO , *i. e.* in an Horizontal Position; the Cylinder EF will be equal to an erect Cylinder upon the same Elliptical Base NEO , and between the same Parallels HF, NO : From F therefore let fall FC perpendicular to NEO produced; and by this Means we shall have the Triangles FEC and ENL similar; for the Angles at C and L are right, and the Angle $FEC = LNE$, seeing each of them, together with LEN , makes a Right Angle: Therefore $FE:FC$ (is CI) :: $NE:EL$:: $2NE:2EL$; Or as the Base E : Is to the Base C . $Q. E. D.$

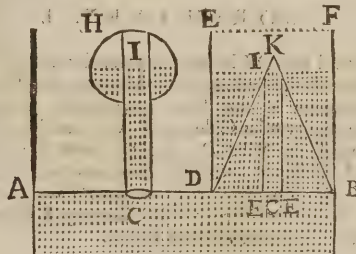
And now the Reason plainly appears, why more Mercury is kept suspended in EG than in CI ; (Fig. 9.) For the Base E of the Oblique Tube EG : Is as much greater than the Base C of the erect Tube CD :: As is the Length of the Former: Than the Length of the Latter.

But then it may be further enquired, Why, in the two equal Cylinders EF and EH , (Fig. 10.) the Mercury should not rise higher in the Former than in the Latter, since Dr. Wallis has demonstrated, Cap. 2. Prop. 19. That equal Bodies gravitate in Proportion to their Declivities; and consequently the Gravity of the Fluid within the Tube EF , being weaken'd by the Obliquity of the Tube, 'tis but reasonable to suppose, That the Mercury should be rais'd to a greater Height than in the erect Tube EH , whose Position does not at all weaken or hinder the Gravitation of the Fluid.

But here it ought to be consider'd, That tho' the Gravity of the Fluid in the Tube EF be lessened in proportion to the Obliquity of the Tube, yet at the same time the Pressure upwards is weakened or hindered in the same proportion, the Angles EFC and FEH being equal; so that here is a sort of Compensation made, and the same Force which keeps the Mercury suspended in EH , will be no more

than sufficient to buoy up that in EF of an equal Altitude with the Former.

Also, since Tubes and Vessels, having the same or equal Bases and Altitudes with Cylinders and Prisms, may, notwithstanding, contain more or less Mercury than those Cylinders and Prisms (as is apparent from Fig. 11.) it may very reasonably be



ask'd, Why the Mercury stands at the same Height in all? *Viz.* Why in the Tube CH , with a round Head, the Mercury should stand at the same Height that it does in the Cylinder CI , upon the same or an equal Base? And why in the Vessel DKB , it should not rise higher than it does in $EDBF$?

The Reason of these two Phenomena I take to be this:

First, In the Tube CH , the Mercury contain'd in the Head, without the inscribed Tube CI , is not supported by the Base C , but by the Sides of the Head of the Tube; and consequently the Pressure upon C , is the same in both Tubes CH, CI ; therefore the Altitude of the Mercury in both of them must be the same.

Secondly, Although the Vessel DKB be much less than the Circumscribing one, yet it will be an easy Matter to account for the Mercury's rising no higher in that than in this; for at those Parts of the Base, as C , where the Mercury has a free Ascent, it arises to a certain determinate Height, as CI , in the Vessel DKB ; but the Ascent of the other Parts DE and EB , is impeded by the Sides of the Vessel DK and KB , as much as if EDI prest upon it; therefore it cannot rise any higher than the Mercury in the Circumscribing Vessel $EDBF$.

PROP. V.

If the Mercury in the Tube CD (See Fig. 9.) be kept suspended at the Altitude CI , yet if the Aggregate of the Tube and Mercury be left to it self to descend freely, it will sink into the Stagnant Mercury so far, till the Gravity D or DC (the Part above the Surface AB) bears the same Proportion to the Gravity of as much Air equal to it in Bulk :: As the Weight of a Quantity of Mercury equal in Bulk to that Part immersed, bears to the Weight of the immersed Part of the Tube, together with the Mercury included in CI .

For the Air upon the Out-side D , of the Top of the Tube DC , is very nearly equal to the Pressure of the Air upon the other Parts of the Surface of the Mercury AB ; but this Pressure upon the Top of the Tube being added to the Pressure of the included Mercury, together with the Weight of the Tube, will make the Pressure upon C more than double to the Pressure upon any other Part, being

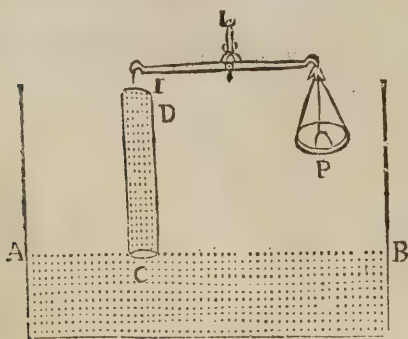
being the Effect of a double Column of Air of the Diameter of the Tube: and the Weight of the Tube and incumbent Air being not sustained otherways, (by *Cor. 3. Prop. 1.*) the Tube will subside so far, till the Part above the Surface bears the same Proportion to as much Air equal to it in Bulk, as a Quantity of Mercury equal in Bulk to the Part immersed, bears to the immersed Part: *Q. E. D.*

COROLLARY. I.

If the Tube *DI* be kept suspended with its End *C* just under the Surface of the Mercury, the Weight or Tendency of the Tube downwards, is equal to the Gravity of a Column of Air, insinuating upon the Top of the Tube *DI*, together with the Excess of the Gravity of the Tube above an equal Portion of Air; or, which is nearly the same Thing, equal to the Weight of the inclosed Mercury *DC*, together with the forementioned Excess.

COR. II.

But if *DC*, the Altitude of the inverted Tube, be less than *CI* (where the Mercury, as in a common Barometer, would stand, were it not hinder'd) and consequently, if the Air press more upon the other Parts, than the Mercury *DC* does upon *C*; then will so much of the Weight of the Tube and Mercury be abated, or so much Weight may be supposed to be taken out of the Scale *P*, (*Fig. 12.*) as is equal to the Excess of the Pressure upon the other Parts above that upon *C*; for the Force upwards in *C* can sustain so much Mercury, as is contained in a Tube whose Altitude is *CI*: Therefore



if the Altitude *CD* be less than *CI*, 'tis plain the Pressure upwards at *C* will be able to buoy up as much more Weight than *DC*, as *DC* wants of *CI*; that is, so much Weight may be taken out of the Scale *P*, to bring it to an *Equilibrium*.

For the Pressure of the incumbent Air upon the Parts of the Surface *AB*, surrounding *C*, is sufficient to sustain either a Column of Air of an equal Weight with the former, or a mixt Column made up of 'em both, which does not exceed the Gravity of one of them, but cannot sustain them both together, or any Thing more than what is equal to the Gravity of one.

Suppose the Part *C* of the Surface of the Mercury *AB* (*Fig. 12.*) exposed to the open Air, then there will be sustained a Column of the incumbent Air, equal to what is sustained by every other equal Part of the Surface; but neither Mercury, nor any thing else more intensively or specifically heavier

than Air, for that would destroy the *Equilibrium*, by *Prop. 1.*

2. If, as in the *Torricellian* Experiment, which suppose made, the Pressure of the incumbent Air be kept from acting upon *C* by *I*, the Top of the Tube *CI*, or any how else; the Pressure at *C* upwards will then sustain a Column of Mercury equal in Gravity to a Column of Air upon the same Base, but it can sustain nothing else; so that the Tube, with the incumbent Column of Air upon the Top of it, must be sustained some other way, either by the Hand, or by an equal Weight in the opposite Scale, &c.

3. If the Pressure of the incumbent Air be kept off only in Part; that is, if the Pondus in the Scale *P*, be less than the Gravity of the Air resting upon the Top of the Tube, and the Tube it self; then *C* will sustain a mixt Column, i.e. partly of Air, part of Mercury: And the Quantity of Air sustained by *C*, is equal to the Excess of the Weight of the incumbent Air and Tube above the Pondus *P*; and the Mercury within the Tube wants just so much of the Weight of the Mercury in the last Case, as that Excess amounts to.

4. If the Pondus in the Scale *P*, be greater than the Weight of an incumbent Column upon the Top of the Tube, together with the Tube it self, then it will elevate the Tube out of the Mercury.

This Matter will still be more clear by the following Instances.

Suppose *C*, (*Fig. 12.*) that Part of the Surface *AB* upon which the Tube insinuates, to be so large, as that being exposed to the open Air, it can sustain a Column of Air of 10 Ounces: Then if the *Torricellian* Experiment be made, and *C* be defended from the Gravitation of the Air upon it, then will, in its room, be suspended a Column of Mercury, or any other Fluid which does not exceed 10 Ounces.

Let us imagine the Weight of the Tube to be two Ounces; then will the Weight of the Tube, together with the incumbent Air, be equal to 12 Ounces nearly, (I say nearly, for any one will perceive, from *Prop. 5.* that it wont be exactly so;) from which Pressure *C* must be entirely freed, which may be done by the Hand, or by 12 Ounces in the Scale *P*.

Now let us suppose 4 Ounces taken out of the Scale *P*, then there will remain only 8, which cannot be a Balance for 12: Therefore the Tube *DC* will sink down into the stagnant Mercury, (the Pressure downwards upon *C* being greater by 4 Ounces, than the Pressure any where else on the Surface of the stagnant Mercury) till the included Mercury weigh only 6 Ounces.

But here it may seem strange, Why 8 Ounces in the Scale *P*, can buoy up the Tube equal to 2 Ounces, added to the Weight of the incumbent Air equal to 10 Ounces: But the Reason of this is evident; for the Pressure upwards in *C*, is 4 Ounces greater than any where else; or, which is the same Thing, 4 of those 12 Ounces (the Weight of the Tube and incumbent Air) will not be perceived, by reason of the contrary Tendency of the Mercury upwards at *C*; so that there will remain only 8 Ounces, equal to the Weight of the Pondus in *P*.

But if, instead of 4 Ounces, the whole Pondus had been taken out of the Scale *P*, *C* would then have a greater Pressure upon it than it is able to bear, and consequently will give way, and suffer the Tube and Mercury to sink quite down to the Bottom of the Vessel.

If, instead of 4 Ounces; 2 only had been taken out of the Scale *P*, there will remain 10 Ounces, which will take off 10 of the 12 Ounces, (the Weight of the Tube and Air together) and the remaining 2 Ounces will press upon *C*; which, with 8 Ounces of Mercury, will make 10; so that the Mercury in the Tube, in this Case, will weigh 8 Ounces, as before it weighed only 6; *i. e.* the Tube will ascend till the Mercury within it weigh 2 Ounces more than it did before.

If 2 Ounces more be added to *P*, the Tube will rise until the Mercury in it weigh 2 Ounces more than before, *i. e.* 10; but if any more Weight be added to *P*, the Tube will be elevated out of the Mercury.

From the foregoing Principles 'twill be no difficult Matter to account for that Experiment of Water rising higher in very narrow Tubes, than the Surface of the Water in which they are immers'd; for if you take a very slender Tube, open at both Ends, and put one End in a Vessel of Water, the Water within the Tube will be found something above the Level of the Water without, more and more proportionably to the Smallness of the Tube in which the Experiment is made.

Robault, in the First Part of his *Physicks*, *Cap. 22. Sect. 85.* tells us, That he thinks this Phenomenon may be thus accounted for: He fancies, That the Particles of Air cannot move so briskly in slender Pipes, as in larger; and consequently, are hinder'd from exercising a Force sufficient to suppress the Water.

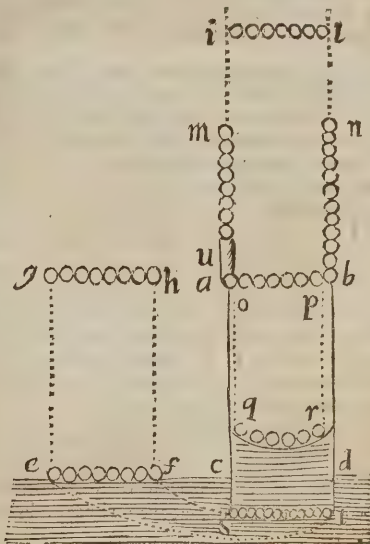
Tho' had but this Gentleman made the same Experiment with Mercury, he would have found the quite contrary Effect, and that the Mercury in small Tubes is depress'd below the Mercury without.

Besides, his Solution will appear precarious to any one that considers the Thing; for I wonder what a free Motion of the Particles of Air hath to do in depressing or elevating Liquors contain'd in Tubes: This is certainly the Effect of Gravity, whose Action is Rectilinear; but this Rectilinear Pressure is no more hinder'd in small Tubes than in larger.

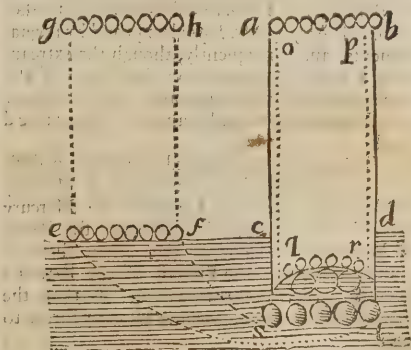
And therefore the Reason why Water in small Tubes rises higher than the Level of the Surface without, according to Hydrostatical Principles, must be either because the Pressure without is increased, for the Pressure within the Tube diminished; but the Pressure without does not seem to be increased by barely putting the Tube into Water, and therefore it follows, the Pressure within is lessen'd: How this can be, is now to be accounted for.

Let there be a small Cylindrical Tube, *abcd*, immersed in the Surface of the Water *ed*, upon which Surface let the Cylinder of Air *efgh* likewise insit: Then let us suppose, that upon the Diameter of each Tube can stand a certain determinate Number of Particles of Air, *viz.* 8; or let 8 Particles of Air, placed in a Right-line, be equal to the Latitude of both Tubes: I say, it can seldom, nay, I believe, it can never happen, that the Eight can be intro-mitted in the Cavity of the Tube; for the upper Edges of the Tube will intercept the First and Eighth, so that only six can fall upon the Water: And the same will hold true of any other Series of Globules, whose two Extream Particles will always fall upon the Brinks of the Tube. Hence it is, that the whole Round of Globules insit upon the Edges of the Tube, together with *am* and *bu*, which they perpendicularly insit upon, gravitate only upon the Edges of the Tube, and never come to the Water *qr*, which is only gravitated upon by a Cy-

linder of Air, whose Diameter consists of six Globules: But 'tis quite another thing in the Aerial Cylinder *efgh*, taken in any Part of the Surface without, where the Extream Globules are not in-



lintercepted by the Sides of the Cylinder *ge* and *ab*, which are purely imaginary, but act freely upon the subjected Liquor: Consequently the Fluid without, is more acted upon than the Fluid within; by how much the Series of Globules insit upon this, exceeds the Series of Globules insit upon that; so that the Liquor without must subside a little, forcing that within the Tube to ascend, till such time as the Pressure be every where equal: But this is scarce perceivable in Tubes of larger Diameters; for the Air insit upon the Brinks of a Tube, bears a greater Ratio to the Air without, whose Pressure is not hinder'd, in small Tubes than in larger, as the subsequent Calculation will make appear.



Let the Diameter of the Aerial Cylinder *efgh* be 7 Globules, and that of the Cylinder *opqr* be 6 Globules; then the Area of the Base of the former will be 38½, and that of the latter 28½, whose Difference is 10½; so that *ef* is press'd upon above ½ more than the Base of the latter *ed*: But if the Diameter of the Base of the External Cylinder

be 14 Globules; and that of the Internal one a Globule less, viz: 13, the Area of the former will be 154, and that of the latter 132 $\frac{1}{2}$, whose Difference will be 21 $\frac{1}{2}$; so that the Pressure of that is now $\frac{1}{2}$ part greater than the Pressure of this: From whence it appears, That the Difference of Pressure is a great deal less in large Tubes than in small.

Upon the same Principles 'twill follow, That lighter Liquors will rise higher in small Tubes than heavier: And now we shall give an Account, why Mercury in a very small Tube should subside below the Level of the external Mercury.

And here it may not be improper to observe, That some People, from the Ascent of Liquors in small Tubes, have vainly hoped for a perpetual Motion; for, say they, 'tis but making a Tube extremely small, and not too long, and then the Ascent of the Liquor being proportional to the Smallness of the Tube, 'twill flow out at the Top, and that continually: But had those People but thoroughly consider'd the Matter, they could not have drawn any such Conclusion; for though the Liquor contained in the Tube be forced to the Top of the Tube, by reason of a less Pressure; yet when it comes to the Top, it meets there with the Globules which before acted only upon the Edges of the Tube, and consequently is hinder'd from overflowing, the Pressure above and below being equal.

But here it may very well be objected, That tho' the Aerial Cylinder *ghf* press upon the subjoined Liquor, yet this Pressure is not wholly derived to the Tube, but partly broken; for the Globules of Water *st*, cannot so exactly flow into the Tube, but the extream Globules *s* and *t*, must light on the Edges of the Bottom of the Tube, and consequently their Pressure be rendered ineffectual, as were *a* and *b* above: and this being true of the whole Round of Globules, they see no reason why the Water should ascend at all, being the Pressure is equally debilitated both above and below.

To obviate which Objection, it may be considered, That the Particles of Water are more volatile and flexible; upon which account they easily glide into the Tube, without suffering any considerable Detriment; whilst those of Air, being more stiff and rigid, suffer much from the Sides of the Tube: Besides, the Particles of Water are smaller than those of Air, as Mr. Boyle has prov'd by several Experiments, and consequently, though the extream Globules *s* and *t* do light upon the Edges of the Tube, yet still the Pressure upwards will be greater than the Pressure downwards, and the Water forc'd to ascend.

These Things being considered, 'twill be no difficult Matter to account for the subsiding of Mercury in small Tubes below the Level of the Mercury without: for by the Law of Contraries, the Particles of Mercury will be more gross than those of Air; and consequently the Pressure of the Particles of Mercury below, upwards will be less than the Pressure of the Air down, and the Mercury forced to descend.

L E M M A.

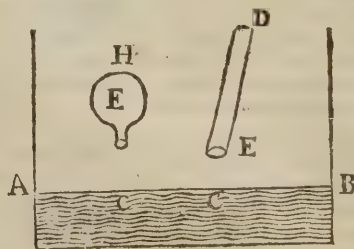
Hitherto we have only taken notice of the Gravity of the Air, without any regard to that other remarkable Property of it; I mean its Elasticity, which Mr. Boyle has prov'd by various Experiments. Now this Elasticity is a Power that Air compressed, either by its own Gravity, or any other way, has

of restoring it self to its former State; and this Elastick Force acts indifferently every way, though in case any Part of the compressed Air be less prest'd upon than the rest, 'twill that way endeavour to free it self from the Pressure upon its other Parts, in order that the Pressure may be equal every where; and this restitutive Force increases in proportion to the Compressive, and is always equal to it.

If any one desire a fuller Account of this Matter, he may consult Dr. Wallis's *Mechanical Philosophy*, P. 1. C. 13. Pr. 1. and L. 14. Pr. 11. This being premis'd, I proceed to the following Proposition.

P R O P. VI.

The Elastick Force of Air contain'd in any Vessel, and which is of the same Nature with the external Air, i. e. is neither more nor less compress'd, does the same thing as the whole Weight of the external Air.



Let there be a Tube, as *D*, or a Vessel, as *H*, of any Form, whose Orifice at *E* is open, and consequently the internal Air communicates with the external; then 'tis plain, that if the external Air be more compress'd than the internal, it will dilate it self, compressing the internal till such times as there be an *Equilibrium*; but on the contrary, if the internal be more compress'd than the external, then will this dilate it self, compressing the other till the *Equilibrium* be again restor'd; i. e. till the Elasticity of the included Air be equal to the compressive Force without; or, which is the same thing, to the whole Weight of the incumbent Air: And if *E* be close, the Elasticity of the included Air will still be equal to the Weight of the external incumbent Air; for the Elasticity won't be in the least altered by the Orifice being stopp'd; therefore the Proposition is clear.

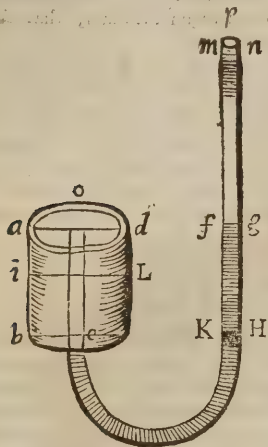
P R O P. VII.

*If the Orifice *E*, of the Tube *D*, or the Vessel *H*, (fill'd with Air of the same Nature with the external *Air*) be put in the Surface *AB* of a Vessel of Mercury, that Fluid will neither rise nor be depress'd.*

Demonstration.

For *C*, that part of the Surface *AB* which the Orifice *E* insits upon, is equally prest with the other Parts of the Surface *AB*, seeing the Elasticity of the Air in *D* and *H*, is equal by the last Proposition, to the Weight of the external incumbent Air; (Here it must be observ'd, that we suppose the Vessel to be sustain'd some other way) and consequently, by Prop. 1. the Mercury will neither ascend nor descend. Q. E. D.

The Ingenious Mr. John Keil thus Mathematically demonstrates the Reason, why Fluids keep at the same Height in Canals, or Pipes of different Dimensions.



Let there be a larger Pipe or Cylinder, as $abcd$, which is connected with the more slender one mnh , at c .

Water being put in at either Orifice, will keep the same Level in both Pipes, or will stand at the same Height in both Legs; so that the Surface of the Water, ad and fg , shall be in the same Plain.

For if by any Force the Water in the larger part $abcd$ should be impelled down, suppose to IL , it must rise so much higher in the lesser Leg of the Siphon, suppose to mn , that the Cylinder of Water mnh shall be equal to the empty part $adiL$.

But when Cylinders are equal, and are of different Bases and Heights, their Bases and Heights must be reciprocally proportional; therefore here $fm:ai::$ As the Orifice ad : To the Orifice mn or fg : But $fm:ai::$ As the Velocity of Ascent in one Tube: Is to the Velocity of Descent in the other; and the Orifice ad : Is to the Orifice $fg::$ As the Water in ac : Is to the Water in the part of the Pipe fH , (for Cylinders of equal Height are as their Bases:) Wherefore the Velocity of the ascending Water in the Pipe fH : Will be to the Velocity of the descending Water in the Pipe $ac::$ As the Water in the Pipe ac : Is to the Water in the Pipe fH ; that is, the Velocities of the ascending and descending Portions of Water are reciprocally proportional, and consequently their Moments must be equal; and being contrary one to another, they will equi-balance each other, and consequently make the Water stand in both Legs at one and the same Height.

The Physical Reason of which Phenomenon is, That no more Water presses on the Orifice c , than what is contained in the Cylinder oc , perpendicularly incumbent on the Orifice (the rest being sustained by the Bottom of the larger Pipe, which extends beyond the Orifice c all round it): Now the Cylinder oc being equal every way to fg , the Water in each will be of the same Height.

From hence also, by the by, may the Reason appear, Why Water, or any other Fluid, flowing out of a larger Pipe or Canal into a slenderer, moves there with a greater Celerity.

Hence also in an Animal Body, if the Ramifications of the Arteries (or the Capillary Arteries) have the Sum of all their Orifices, or rather of their Transverse Sections, greater than the Area of the Transverse Section of the Aorta; or great Artery, the Velocity of the Motion of the Blood in them will be less than in the Aorta; but if the Sum be less, the Motion of the Blood there will be swifter than in the Aorta.

HYDROTICKS, or Medicines that provoke Sweating, are those which by fermenting and attenuating the small Parts, penetrate into the closest Pores of the Blood, divide its Particles, rarify them, and turn them into a kind of Vapour, which, together with whatever they meet, and can carry with them, they drive out into the Surface of the Body, and there being condens'd into an insensible Liquor, they appear in the Form of Sweat. *Blanchard*.

HYEMAL-SOLSTICE: See *Solstice*.

HYGIEA, is Health, which consists in a good Temperature, and right Conformation of Parts.

Health is a Disposition of the Parts of an Human Body, fit for the Performance of the Actions of that Body.

Signs of Health are Three, due Action, suitable Qualities, and when things taken in and let out are proportionable. *Blanchard*.

HYGIEINA, is that Part of Physick which teaches the way of preserving Health: Some divide it into three Parts.

Prophylactick, which takes Notice of future imminent Diseases.

Synteritick, which preserves present Health: And,

Analeptick, which recovers the Sick. *Blanchard*.

HYGROCYSOCELE, is a Branch of any winding Veins, swoln with ill Blood, accompanied with other Moisture. *Blanchard*.

HYGROMETER, the same with *Hygroscope*; which see.

HYGROSCOPE, is a Philosophical Instrument, contrived to shew the Moisture or Dryness of the Air, according as it abounds with watry or dry Steams; and to measure and estimate the Quantity of such Moisture or Dryness.

To make a Hygroscope with Oil of Vitriol.

Procure a good nice pair of Scales, not too slight, that will turn with about $\frac{1}{2}$ part of a Grain, (or $\frac{1}{4}$ part of a Grain will do pretty well) into one of these in a flat Glass of about 3 or 4 Inches in Diameter (such a kind of Glass as holds the stagnant Mercury in the Baroscope) put 3 or 4 Drams of the Oil of Vitriol; hang up the Balance in a place free from the heat of the Sun's immediate Beams, or a Fire; and put Weights in the other Scale, to reduce it to an *Equilibrium*, you will be surpris'd to find that this Liquor will, if it was good, and well dephlegmated, double, nay, perhaps treble the Weight in a Fortnight, by attracting and imbibing the Moisture of the Air: But so it will certainly do more or less, according to the Season of the Year, and the Temper of the Weather. You must let this Liquor hang till you find it hath gain'd its utmost Increase of Weight, which will be in less than a Fortnights time, unless it be exceeding dry and hot Weather.

And then you may begin to make use of it as an *Hygroscope*: For as the Oil of Vitriol preponderates, the Air increases in Moisture; and as the other

ther Scale, where the Weights are, preponderates, its Drought increases in the same Proportion. The Degrees of Moisture, or Dryness, may be computed either by small Weights put into the lighter Scale, or else by having the Handle of the Scale very long, as also the Tongue; so that it shall with its Top mark the Divisions on an Arch of Brads, that may be applied for that purpose on the Top of the Handle, over the Tongue of the Balance.

The Hygroscope of Mr. William Mollyneux, Secretary of the Philosophical Society at Dublin, is thus made:

Fasten a Piece of Whip-cord, of about 4 Foot long, to an Hook or Staple, in some convenient Place of the Ceiling of a Room, and at the Bottom hang a Weight of about a Pound: Let thereon, or into the Bottom of the Weight, be fastened an Index of about a Foot long, and under it, on a Table, or on a Piece of Board, place a Circle, divided into what Number of Degrees you please, and fit it so that the Center of the Index may hang just over the Center of the Circle.

After it has hung thus 2 or 3 Days to stretch the Cord, you may begin to measure by it, the Degrees of Moisture or Drought in the Air: For the Cord will twist one way, and contract it self for Wet, and untwist it self again on the contrary way for Dry. You will find this plain and simple Instrument the nicest *Hygrometer* of any, for it will shew you very small Alterations of the Temper of the Air, and is subject to fewer Inconveniencies than any other Instrument of this kind.

A very good Hygroscope may be thus easily made.

Take a small Deal-Box, and to the Bottom, or one of the Sides of it, fasten strongly a pretty large Piece of Lute-string or Cats-gut; and then bringing the other End thro' a Hole purposely made for it in the opposite Part or Side of the Box, and which must be so much bigger than the String, that the String may turn easily round in it any way: Fasten to the String (without) a light Index, made of a Piece of Cedar or Deal, &c. and round about the Hole where the String comes thro', draw a Circle on the Box, and divide it into Degrees; so that the String twisting and untwisting it self, as it will do against wet or dry Weather, may turn the Index along with it, and that will shew in the graduated Limb of the Circle, the Measure of the Air's Moisture or Dryness.

I have often tried this kind of Hygroscope, and found it to do very well. But Dr. Hook, in his *Micrographia*, saith, Nothing will shew the Variations of Moisture and Dryness in the Air like the Eard of a Wild Oat; which he there (P. 147.) shews you how to fit in a proper Box or Frame, and with an Index, &c. But I believe the Cats-gut one, tho' not so very tender as this, (and yet I have known one go twice round the same way) may retain its twisting and untwisting Property much longer.

I always found the Wind to have a peculiar effect upon this Instrument.

Another Hygroscope of two Plain Boards.

Plain two pieces of Deal, or (which is better) of Poplar Boards, of about two Foot long, and a Foot and a half in breadth, and let them be shotten or jointed, so that their Edges will meet even together;

let those be set close together like a Pannel of Wainscot, with their Tops and Bottoms let into the Groove of a strong Oaken-Ledge, and their four outward Corners pointed into the Groove; But there need be no Ledges on the Sides, that the Boards may play the better.

Then, since every one knows that these Boards will shrink very much in exceeding dry Weather, and consequently gape or open from each other; suppose the utmost Distance that they will shrink from each other to be a quarter of an Inch, more or less, it matters not much. Take a thin piece of Brads of two or three Inches long, and about a quarter of an Inch broad, and measuring at one end of it a quarter of an Inch (or that distance you suppose your Boards will shrink) divide it into five equal Parts, and then with a small File cut those Divisions into so many small Teeth, like those of a Watch-wheel: Then drilling 2 or 3 Holes in this piece of Brads towards the other end, with some small Nails fasten it on one of your Boards, so that the first of the 5 Teeth may lie just over the Junction of the Boards, and the rest lie over the other Board. Next on the end of a piece of thick Iron-wire, make a Pinion of 3 Teeth to answer the 5 Notches in the Brads-plate; and by means of a Bracket, let it be so fasten'd on the other Board, that its Axle playing in the Bracket, it may fit the Teeth of its Pinion to the Notches in the Brads-plate; and then whenever the Boards shrink asunder, the Brads being drawn a little away, must needs turn this Axle more or less; and when the Boards have shrink'd a quarter of an Inch from each other, the Axle will have made one entire Revolution. If then you fasten a long and light Index on the Extremity of this Axle, and make a Circle round it, divided into what number of parts you please, the Motion of the Point of the Index, backwards or forwards, will shew you the Degree of Moisture or Drought in the Air.

You may easily have the Axle so long, as that its Index-end shall come thro' a round Plate of Wood or Metal, which may hide all Contrivances, and make it appear only like a Clock or Watch.

HYGROSCOPE STATICAL, was invented by that Noble Philosopher Mr. Boyle. The best way to make it, is to take a Dram weight of fine Sponge, and having well cleaned it and dried it, let it be put, when the Air is of a moderate Temperature, into one of the Scales of a very nice and tender Ballance, (that will turn, when so loaded, with half a quarter of a Grain) and in the other Scale put so much weight as will just equi-ponderate it. Then will the Sponge by its increase and decrease of Weight, daily shew the Moisture or Dryness of the neighbouring Air, and measure its Quantity by Weight; whence it hath its Name of the *Statistical Hygroscope*.

I have often tried this Instrument myself, and have found it to answer very nicely, and to increase or decrease in Weight very conspicuously, according as the Air hath been Moist or Dry.

If you think the taking out or putting in of such small Weights, as Grains, or their Subdivisions, (of which there will be constant occasion) to be troublesome, you may easily fit the Arch of a Semi-circle well divided, as that against it the Tongue of the Ballance shall play, and by the Degree there cut, shew you the quantity of the increase or decrease in weight of the Air's Moisture: But the former way is more exact and will be easy enough with a little Practice.

The

The above-mentioned Honourable Gentleman hath a little Treatise upon the Uses and Advantages of *Hygroscopes*; wherein he proves this *Statical one* to have many Advantages above the other Kinds. For,

1. It will last good longer than most of them.
2. As it is easily made at first, so 'tis as easily repaired or mended, if it come to any Injury.
3. The Quantity of the Drought or Moisture of the Air it measures, is easily communicable to a Correspondent by Letter, &c. because it is estimable in the known Weights of Grains and their Parts; whereas in most other *Hygroscopes* 'tis not so easy for another Person, besides the Observer, to judge of the Quantity of the Alteration.

The Uses and Advantages of these kind of Instruments when well made, and carefully observed, he judges may be such as these:

1. To discover in what part of Day or Night the Air hath its greatest degree of Moisture; and how at such times the Baroscope stands affected; whether near the Sea-side, the Ebbing and Flowing of the Sea make any sensible Alteration as to the Moisture or Driness of the Air; and whether at the Fall and New Moons the Atmosphere be most damp and moist; and whether the Menstrual or Annual Spring-Tides, have any sensible Operation on this Instrument.
2. To discover how much one Year and Season is drier or moister than another; whether the multitude or fewness of Solar Spots occasion (as some Astronomers have observed) any Alteration in the Temperature of the Air, as to Wet or Dry; And those that are Astrologically given, may observe, whether the Aspects of the Planets, their Eclipses, Conjunctions, &c. have any Influence this way on our Atmosphere.
3. To discover and compare the Changes of the Temperature of the Air made by Winds, strong or weak; or by Frosty, Snowy, or other Weather.
4. To compare the Temperature of differing Houses, and differing Rooms in the same House; which may be of great Use to Tender and Sickly Persons; and to keep a Chamber, if there be occasion, constantly to the same, or any assigned degree of Driness.

HYMEN, is a circular Folding of the inner Membrane of the *Vagina*: and this being broke (in *primo Coitu*) its Fibres contract in three or four places, and so form the *Glandule Myrtiformes*.

HYOIDES, and by some *Os Upsilonoides*, from its being in Figure like the Letter Υ , is a Bone placed at the Basis of the Tongue upon the Larynx: It hath 10 Muscles which keep it in its place above by its upper *Cornua*; 'tis fastened to the *Apophyses Scyloides* of the Temple-Bone, and below to the Wings of the *Cartilago Theorides* of the Larynx.

HYOTHYROIDES, are two Muscles of the Larynx, proceeding from the Inferior Part of the Bone *Hyoides*, laterally and opposite to the Origination of the *Ceratoglossus*.

This pair of Muscles descends directly to the lower part of the *Cartilago Scutiformis*: Its Use is to draw the Larynx upwards in an Acute Tone of the Voice; the Canal of the *Aspera Arteria* being also freighted by it.

HYPETHRON, is an open Gallery or Building, the inside whereof is uncover'd, and exposed to the Weather. The Ancients gave this Name to all Temples which had no Roof; as that of *Jupiter O-*

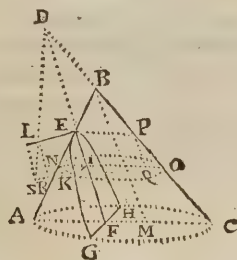
lympius at Athens, having 10 Columns in Front, as also two Rows in its exterior Sides, and one in the Interior.

HYPALLAGE, or *Immutation*, a Grammatical Figure, when of different Expressions, which give the same Idea, we make choice of that which is least used; or, when there is a mutual Permutation or change of Cases: As in this Instance, *Dare Classibus Austros*, instead of *Dare Classes Austris*.

HYPERBATON, a Grammatical Figure, where there is too bold and frequent a Transposition of Words.

HYPERBOLA, in Geometry, is a Section of a Cone made by a Plane, so that the Axis of the Section inclines to the opposite Leg of the Cone, which in the Parabola is parallel to it, and in the Ellipsis intersects it. The Axis of the Hyperbolical Section will meet also with the opposite side of the Cone, when produced above the Vertex.

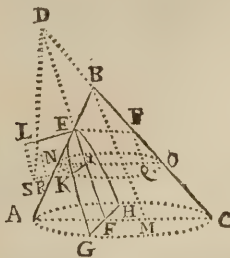
Thus, in the annexed Figure, the Curve *GEHF* is an *Hyperbola*.



Where the Line *ED*, being the Continuation of the Axis till it meet with the opposite Cone, or opposite side of the former Cone *CB* produced, is called by the Name of the *Latus Transversum*; and the middle Point of that Line *ED*, is called the *Center of the Section*, or rather of the *opposite Sections*.

PROP. I.

In an Hyperbola *GEHF*, the Square of the Ordinate *IK*, is equal both to the Rectangle *LJ*, made under the Parameter *LE*, and the Abscissa *EI*; and also to the Rectangle *LS*, made under the Abscissa *EI* (or *LR*) and another Line *SR*, which is a fourth Proportional to *DE* the Latus Transversum, *EL* the Parameter (or Latus Rectum) and *EI* the Abscissa.

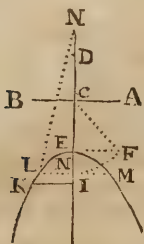


Let the side of the Cone *AB*, in which the Section is, be called *a*; and thro' *B* the Vertex of the Cone, draw *BM* parallel to the Axis of the Section, and which call *b*. Let the intercepted part of the

$DE = ob$, and $EI = eb$ and $DFE = oibb + iibb$, as was proved just above. Now there is no doubt but $oobb + eebb : oibb + iibb :: e + ee : oi + ii$; wherefore these Rectangles are as the Squares of the Ordinates. Q E D.

COROLLARY I.

If the *Latus Rectum* LM be applied so, as that N be the Focus, then will $LN = \frac{ocd}{2b}$ and its

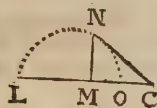


Square $= \frac{oocdd}{4bb}$: But (by this Proposition) As the Square KI : Square LN : So is the Rectangle DIE : Rectangle DNE ; that is, as $oecd + eecd : \frac{oocdd}{4bb} :: oebb + eebb : \frac{oecd}{4}$, which will be found to be the fourth Term by this way of Notation! Also this Rectangle DNE (being made out of the whole Line DE , with the Part added EN , multiplied by that Part added EN) together with the Square of CE , the Half of DE ($= \frac{1}{2}$ of $oobb$, i. e. $\frac{1}{4}$ of ob -Square) is equal to $\frac{oecd + oobb}{4} = CN$ Square, the half Line with the Part added: Wherefore CN is the Distance from the Focus $= \sqrt{\frac{oecd + oobb}{4}}$, of which the former Part $\frac{oecd}{4}$, is the fourth Part of the Rectangle under the *Latus Rectum* ($\frac{ocd}{b}$) and *Transversum* (ob); or, as *Apollonius* calls it, the fourth Part of the Figure; and the other Part $\frac{oobb}{4}$ is $\frac{1}{4}$ of the Square of the *Latus Transversum*: So that from hence we may have a Canon to determine the Focus of any Hyperbola; thus,

Add the Fourth Part of the Figure (or of the Rectangle under the *Latus Rectum* and *Transversum*) to the Square of half the *Latus Transversum*; and extract the Square Root of the Sum, that Root shall be the Distance of the Focus from the Center $= CN$. And if from CN you take half the *Latus Transversum* CE , the Remainder EN is the Distance of the Focus from the Vertex.

Which Rule is very easie in Practice, for $\frac{oobb}{4}$ is nothing but the Square of CE , and $\frac{oecd}{4}$ is only $\frac{1}{4}$ of DE multiplied into LM .

Wherefore find a mean Proportional between $\frac{1}{2}$ of $DE = MO$, and LM , which let be MN (in this Figure.)



And then make $MC = CE$ of the Hyperbola; for then shall the Hypotenuse NC , be the Distance from the Center C to the Focus N required.

COROLLARY II.

Since the Rectangle $DNE +$ Square $CE =$ Square CN , therefore the Square $CN =$ Square $CE =$ Rectangle DNE : Put therefore, for Brevities sake, $m = CN$, and then will the Rectangle $DNE = mm - \frac{oobb}{4}$ in this Notation, of which more below:

PROP. III.

In the Hyperbola (See Fig. of Prop. 1.) the *Latus Rectum* is to the *Latus Transversum* as the Square of any Ordinate IK is to the Rectangle DIE , contained under the Lines intercepted between it and the Vertices of the *Latus Transversum* and the Abscissa.

For here (as above) $\frac{oecd}{b} = \text{Latus Rectum, } ob = \text{Latus Transversum, and } oecd + eecd, \text{ will be } KI \text{ Square; and the Rectangle } DIE \text{ is } oebb + eebb$; wherefore place those Terms according to the Condition of the Proposition; as

$$\frac{oecd}{b} : ob :: oecd + oecd : oebb + eebb$$

And trying by multiplication of the Extreams and Means, you will find the same Quantity $e o o b b d + e e b b o d$ arise from both, and therefore the Terms are truly proportional. Q E D.

COROLLARY I.

In the Hyperbola (see Fig. 1. of Cor. 1. of Prop. 2.) if AC Square, or its equal FE Square ($= \frac{oacd}{4}$, which is $\frac{1}{4}$ of DE multiplied into LM) be taken out of CF Square, or its equal CN Square (i. e. out of $\frac{oecd + oobb}{4}$, by Cor. 1. Prop. 2.) there will remain $\frac{oobb}{4}$ whose Square Root is $\frac{ob}{2} = CD =$ half the *Latus Transversum* DE .

Wherefore here, if the Axis be given, the Foci are so too: For draw thro' the Vertex E , EF perpendicular to ED , and equal to CA , and with the Distance CE , setting one Foot of the Compasses in C , cross the Axis at N and N ; so shall these Points be the Foci required.

COROLLARY II.

Since (by Cor. 1. Prop. 2.) the Rectangle DNE $= \frac{oocd}{4}$; which Quantity $\frac{oocd}{4}$, is also (by Cor. 1. of this Proposition) proved equal to AC Square; 'tis plain the Rectangle $DNE = AC$ Square, or to a fourth Part of the Figure, as Apollonius calls it.

COROLLARY III.

Hence 'tis plain, That the Square of CE , half the Transverse Diameter: is to the Square of AC or EF , half the Second Diameter, as 'tis called :: as the Latus Transversum: to the Latus Rectum.

For $\frac{oobb}{4} : \frac{oocd}{4} :: oobb : oocd :: obb : ocd :: ob : \frac{ocd}{b}$.

COROLLARY IV.

Again, Since CE Square : AC Square :: $ob : \frac{oocd}{b}$ (by Cor. 3.) that is, As the Rectangle DIE : IK Square (by this Proposition) :: the Square of half the Transverse Diameter : is to the Square of half the Second Diameter; (or, by Cor. 2. to the Rectangle $ENE = AC$ Square) :: as the Rectangle DIE : to the Square of the Ordinate IK .

COROLLARY V.

Hence the Square of the Ordinate KI (Prop. 3.) which hitherto in the Hyperbola hath been denoted by $oecd + eebb$, (see Prop. 1.) may receive a new and useful Notation, thus: since $CE = \frac{ob}{2}$

its Square will be $\frac{oobb}{4}$; say therefore, As CE Square: to the Rectangle $DNE ::$ Rectangle DIE : to a fourth Term, which will be the Square of the Ordinate IK ; and in this Notation it will stand thus;

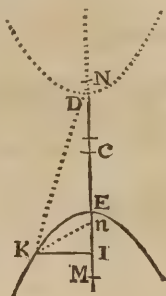
As $\frac{oobb}{4} : mm - \frac{oobb}{4} ::$ so is $oebb + eebb$: to $\frac{4emm}{o} + \frac{4emm}{oo} - oebb - eebb$; so that the Square IK is equal to $\frac{4emm}{o} + \frac{4emm}{oo} - oebb - eebb$. The Use of which will follow in the next Proposition.

PROP. IV.

In the Hyperbola, the Difference between the Right Lines KN and Kn , drawn from the same Point in the Curve to both the Foci, is always equal to the Transverse Diameter or Axis DE .

From the Point K in the Curve, let the Ordinate KI be applied; then will EI be the Abicissa, and noted e . Let CN or Cn , the Distance from the Focus to the Center, be called m , as in Cor. 2. of Prop. 2. then will $IN = CI + CN = \frac{1}{2}ob + eb + m$; and $In = CI - Cn = \frac{1}{2}ob + eb - m$.

Square each, and IN Square $= \frac{1}{4}oobb + oebb + eebb + obm + 2ebm + mm$: And In Square $= \frac{1}{4}oobb + oebb + eebb - obm - 2ebm + mm$.



To each of which Squares add the Square of the Ordinate IK , which in this Notation will be found to be $\frac{4emm}{o} + \frac{4emm}{oo} - oebb - eebb$, (see Cor. 5. of Prop. 3.) and there will arise the Square of the Hypothenuses $KN = \frac{1}{4}oobb + obm + 2ebm + mm + \frac{4emm}{o} + \frac{4emm}{oo}$, and of $Kn = \frac{1}{4}oobb - obm - 2ebm + mm + \frac{4emm}{o} + \frac{4emm}{oo}$.

Out of which Quantities extract the Square Roots, as may easily be done, and there will be found,

$$KN = \frac{1}{2}ob + m + \frac{2em}{o};$$

And

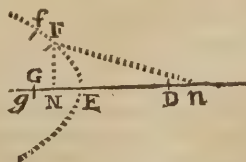
$$Kn = \frac{1}{2}ob - m - \frac{2em}{o};$$

Whose Sum is just ob . Q. E. D.

N.B. Tho' the last, $Kn = \frac{1}{2}ob - m - \frac{2em}{o}$, be an impossible Equation, yet 'tis no matter here, because all the Parts, but $\frac{1}{2}ob$ are lost in the Addition.

PROBLEM I.

To describe an Hyperbola, having the Transverse Diameter DE , and the Foci N and n given.



From N , at any convenient Distance, as NE , strike an Arch, and keeping the Compasses at that Distance with one Foot in E , mark the Point G in the Axis continued; then with the Length GD , and one Foot in n , cross the former Arch F , so shall you find a Point which is in the Hyperbola: and by this Method repeated, you may find another Point f further on, and so many as you please. The Reason of which is evident from this Proposition.

PROP.

PROP. V.

Let the Second Axis or Conjugate Diameter of the Hyperbola BA be brought down and placed at the Vertex parallel to the Ordinates, as OP ; then if from the Center C , you draw thro' the Points O and P two Right Lines running on infinitely: And after this draw a Parallel to this Diameter within the Hyperbola, as QR , I say,

It will be plainly demonstrable,

I. That the Parts of the produced Ordinates GQ and HR , intercepted between the Curve and the Asymptotes, will always be equal.

For the Triangles CEP and CFR , being similar, as also CEO and CFQ , it must be, As CE : EO (or EP): : CF : FQ or FR : But OE and EP are equal; wherefore QF and FR must be equal; from which taking the equal Ordinates, the Remainders HR and DG must be equal. $Q. E. D.$

II. The Rectangle under QG and GR (or RH and HQ) will ever be equal to the Square of EO ($= ood$) or to a fourth Part of the Figure.

For the Triangles CEO and CFQ being similar, CE : EO : : CF : FQ : : or as the Square CE : Square EO . That is, (by Cor. 3. Prop. 3.) as the *Latus Transversum*, to the *Latus Rectum*. That is, by the same Proposition, as the Rectangle DFE , is to FG Square. And CE Square EO Square: : CF Square: FQ Square. But if from CF Square, you take away the Rectangle DFE , there will remain CE Square (by 6. E. 2. Euclid.) And if from the Square of FQ you take the Square of FG , there will remain the Rectangle QGR , (by 5. E. 2. Euclid.) and as will presently appear, if you try it Algebraically, after the manner of the Demonstrations in that Book. Wherefore these two Remainders must be to each other, as their Wholes, i. e. as the Square of CF , to the Square of FQ : : or as CE Square: EO Square; and then it will stand thus:

$$CE \square : EO \square :: CE \square : \text{Rectangle } QGR.$$

Or Inversely: As,

$$EO \square : CE \square :: \text{Rectangle } QGR : CE \square.$$

That is, the Square of EO , and the Rectangle QGR , have the same Proportion to the same thing, and consequently are equal one to another.

And this will be the Case every where, let the Asymptotes run never so far. And since the farther you go from the Vertex of the Angle C , the longer must the Lines GR , gr , of necessity grow, since the Rectangle between GR and QG is always the same, viz. $= OE$ Square, the shorter must GQ , gq , continually grow; and consequently decrease infinitely, as the others increase infinitely; i. e. The Curve will infinitely approach to the Asymptote.

But yet they can never coincide, or meet with one another: For if the Points G and Q , or g and q , &c. should ever come to be co-incident, it will be, As the Rectangle DFE : FG Square: : So

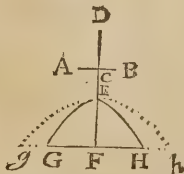
will CF Square: be to FG Square (for GF Square and FQ Square, would then be the same thing); that is, Rectangle DFE would be $=$ to CF Square, which is utterly impossible, as is plain from 6. E. 2. Euclid.

Wherefore these Lines are true Asymptotes, as Apollonius named them from this Impossibility of Co-incidence with the Curve of the Hyperbola; when placed in this Position, Vid. Apoll. Prop. 1. Lib. 2.

HYPERBOLE (in Rhetorick) is a Figure which represents Things greater, lesser, better, &c. than in reality they are; and is used in Discourse, when our ordinary Terms are too weak or too strong, and carry no Proportion with our Idea; and left we should speak too little, we fly out, and say too much, or the contrary: As to express the Swiftnefs of a Horse, one should say, He was *swifter than the Wind*; if the Slowness of a Person, That he moves *slower than a Snail*.

HYPERBOLICK SPACE, is the Area or Space contained between the Curve of an Hyperbola and the whole Ordinate.

Any Hyperbolick Space $GEHG$: is to any other Hyperbolick Figure of the same Height $geb g$, (whose *Latus Rectum* and *Transversum*, as in the Circle, are equal, and also both equal to DE , the *Latus Transversum* of the former Space): : As the Conjugate Axe AB : is to the *Latus Transversum* DE .



For the Square of gF (the Ordinate) is $=$ to the Rectangle DFE , (by the Hyperbola): Wherefore the Rectangle DFE ($=$ Square FG): is to the Square FG : : as *Latus Transversum*: is to *Latus Rectum* of the Hyperbola $GEHG$; i. e. as the Square DE : Square AB . Wherefore the Roots of these Squares will be also proportional, and consequently Fg : FG : : DE : AB ; the former two Terms of which being each an Indivisible of the two Hyperbolick Spaces, it will follow, that the whole Spaces are in the same Proportion.

Wherefore $geb g$: $GEHG$: : DE : AB .

Or $GEHG$: $geb g$: : AB : DE .

$Q. E. D.$

Hence, if you find the Quadrature of any Hyperbola, whose Parameter and *Latus Transversum* are equal, you may square any other Hyperbola.

In *Philosoph. Transact. Numb. 34.* there is a Quadrature of the Hyperbola by an infinite Series of Rational Numbers.

In *Numb. 53.* there is a Method communicated by Sir Christopher Wren, for grinding Glasses of an Hyperbolick Figure.

HYPERBOLICUM ACUTUM, is a Solid made by the Revolution of the infinite Area of the Space contained between the Curve and the Asymptote, in the Apollonian Hyperbola, turning round that Asymptote; this produces a Solid or Body infinitely long, and yet as Torricellius plainly demonstrates,

$D d d 2$

(who

(who gave it this Name) it is equal to a finite Solid, or Body.

HYPERCATALEPTICK Verse : See *Deposition*.

HYPERCATHARSIS, is a Purge that works too much.

HYPERCRISIS, is a Critical Excretion above measure.

HYPERDISYLLABLE, is a Word of more Syllables than two.

HYPEROON, are the two Holes in the Upper Part of the *Ossa Palati*, which receive the pituitous Humours from the Mamillary Processes, and after they are separated, discharge them at the Mouth. Tho' those a Branch of the Fifth Pair of Nerves passes to the Palate, Uvula, and Gums.

HYPEREPHIDROSIS, is too much Sweating.

HYPERSARCOSIS, is an Excrescence of Flesh in any part.

HYPERTHYRON, in Architecture, is a large Table, usually placed over Gates or Doors of the Dorick Order, above the Chambrante, in form of a Frize.

HYPHEN, is an Accent in Grammar, that implies two Words are to be join'd, as *Male-Sanus*.

HYPNOTICKS, are those Things, which by either fixing the Spirits, or by straining and shutting up the Pores, cause Sleep. *Blanchard*.

HYPOBIBASMUS : See *Equation*, N. 4.

HYPOBOLE, is a Figure in Rhetorick, whereby we answer what we prevented to be objected against by an Adversary.

HYPOCHONDRIACA Affectio : See *Hypochondriacus Affectus*.

HYPOCHONDRIACUS Affectus, is (saith *Blanchard*) a kind of Convulsive Passion or Affectio, arising from the flatulent and pungent Humours in the Spleen or Sweet-bread, which afflicts the Nervous and Membranous Parts.

Or, as others say, it proceeds from windy Humours bred in the *Hypochondres*, whence a black Phlegm ariseth that infects the Animal Spirits, and they the Mind, and is what they call *Hypochondriack Melancholy*.

HYPOCHONDRIUM, or *Subcartilagineum*, is the Upper part or Region of the *Abdomen*, under the Cartilages of the Chest or short Ribs : In the Right *Hypochondrium* lies the Liver, and a part of the Stomach ; in the Left the Spleen, and a greater part of the Stomach.

HYPOCHYMA, is a depraved Sight, whereby Gnats, Cobwebs, little Clouds, or such like, seem to swim before the Eyes. The Cause of it seems to consist in turbid Humours, or sometimes in the Optick Nerves, whose little Pores are obstructed by the Matter that is thrust into them. *Blanchard*.

HYPCHYSIS, the same with *Hypochyma*.

HYPOCRATIS Manica, *Hippocrates* his Sleeve : See *Manica Hippocratis*.

HYPOGASTRICK-ARTERY, is by some said to be a Branch of the internal *Iliaca*, and distributes it self among the parts of the *Hypogastrium*, to the Bladder, *Rectum* (in Females to the outer and inner side of the *Matrix* and *Vagina*) *Vesiculae Seminales*, *Prostate Penis*, and to the *Os Sacrum*, and all Parts continued in the *Pelvis* : Then it gives two considerable Branches, which go out of the lower Belly ; the first passes under the *Pyriformis*, and goes to the *Glutei* ; the second goes to the *Obrutators* and the *Gluteus Major*.

HYPOGASTRIUM, is the lowermost Region of the *Abdomen*, reaching from three Inches below the Navel, to the *Abdomen*, *Os Pubis*, and Groins.

HYPOGLOSSIS, or *Ranula*, is an Inflammation or Exulceration under the Tongue : Also a Medicine that takes away the Asperity of the Larynx. *Blanchard*.

HYPOMOCHLION, or *Prop*, in Mechanicks, signifies the Roller, which is usually set under the Leaver, or under Stones or Pieces of Timber, to the end that they may be more easily lifted up or removed.

HYPOPHTHALMIA, is a Pain in the Eye under the Horney Tunick. *Blanchard*.

HYPOPHORÆ, are deep, gaping, and fistulous Ulcers. *Blanchard*.

HYPOPHYLLOSPERMOUS-PLANTS, are such as bear their Seeds on the Backsides of their Leaves, as the *Capillaries* : See that Word.

HYPOPHYSIS, the same with *Hypochyma*.

HYPOPYON, is a gathering of Matter under the Horney Tunick of the Eye, which sometimes covers the whole *Pupil*, hindering the Sight, and sometimes incompasses the Circle of the *Iris*, like the paring of a Nail ; whence 'tis called *Oxyx* or *Unguis*.

HYPOSARCA, the same with *Anasarca*.

HYPOSARCIDIUM, the same as *Anasarca*.

HYPOSILOIDES : see *Hyoides*.

HYPOSPATHYSMUS, is an Incision in the Forehead, made by three Cuts or Divisions, and where the Spatula is thrust in under the Skin. *Blanchard*.

HYPOSPHAGMA, is a Blood-shot from a stroke upon the Eye.

HYPOSTASIS Urine, is that thick Substance which generally subsides at the Bottom of the Urine.

HYPOSTASTICAL Principles ; *Paracelsus* and his Followers, called the three Chymical ones, *Salt*, *Sulphur*, and *Mercury*, so.

HYPOTENAR, is a Muscle which helps to draw the Little-finger from the rest.

HYPOTHENAR, is the Space from the Fore to the Little-finger. *Blanchard*.

HYPOTHENUSE, in a Right-angled Triangle, is that side which subtends the Right-angle, and consequently the longest. The Square of this Line in a Right-angled and Right-lined Triangle, is always equal to the Sum of the Squares of the other two sides, *Prop. 47. E. 1. Euclid* : see the Demonstration under *Triangle*.

HYPOTHESIS, the same with *Supposition* : When for the Solution of any *Phenomena* in Natural Philosophy, Astronomy, &c. some Principles are supposed as granted, that from thence an intelligible and plausible Account of the Causes, the Effects of the proposed *Phenomena* may be given, the laying down or supposing such Principles to be granted, is called an *Hypothesis* ; and the thing said to be accountable easily according to that *Hypothesis*, if it give a clear and easie Solution of the *Phenomena*. Wherefore an *Hypothesis* is a Supposition of that which is not, for that which may be ; and it matters not whether what is supposed be true or not, but it must be possible, and should always be probable.

An *Hypothesis*, in some Sense, falls in with a System : But this Word is usually taken in respect to the Universe, and in Relation to the Dispositions of the Heavens, and the Motion of the Stars : An elaborately contrived *Hypothesis* about which, is called a System ; as the *Ptolemaick*, *Copernican*, or *Tychonian* System.

HYPOTRACHELION, in Architecture, is the Top or Neck of a Pillar, or the most slender Part of it which toucheth the Capital.

It is taken by some for that part of the *Tuscan* and *Doric* Capitals which lies between the *Echinus* and the *Astragal*; and is otherwise called the *Collar*, *Gorge*, or *Frize of the Chapter*.

HYPOTYPOSIS, is a lively and exact Description of any Object made in Fancy.

HYPOZOMA, is a Membrane that parts two Cavities, as the *Mediastinum* in the Thorax. *Blanchard*.

HYPSILOGLOSSUS: see *Basioglossus*.

HYSTERALGIA, is a Pain in the Womb, proceeding from an Inflammation, or otherwise. *Blanchard*.

HYSTERICA, are Medicines against the Diseases of the Womb.

HYSTERICA-PASSIO, Fits of the Mother, is (according to some) a Convulsion of the Nerves of the *Par Vagum* and Intercostal in the *Abdomen*, proceeding from a pricking Irritation or Explosion of the Spirits: This Distemper does not always, nor indeed usually, depend upon the Womb, as is commonly thought: 'Tis seen sometimes in Men, because the Spleen, Pancreas, and other adjacent Bowels, are often the Cause of it. *Blanchard*.

Dr. Purcell, in his Book of Vapours, attempts to prove, and with Probability, That the Cause of Hysterick Fits is neither the *Six Non-natural Things*, nor the solid Parts of the Body, nor the Blood, nor any of the Recrements, nor the Womb, nor Vapours thence arising, nor the irregular disorderly Motion

of the Animal Spirits; nor is it in the Chyle, or in the Ferment of the Stomach or Guts, &c. But he supposes the true Cause to be Crudities and Indigestions in the Aliments, which, by little and little, gather together in the Wrinkles and Folds of the Stomach and Guts; where they (as he supposes) lie for some time without much sensible Motion or Fermentation within themselves, till at last by the Heat of the circumjacent Parts, their grosser Salts are divided and put into Motion; which Fermentation is augmented by the various Juices which flow into the Guts from the many Glands which are placed in the Lower Belly; and by this means they are so dissolved and liquified, as to enter in by the *Vena Laëna* into the Blood, where they produce those Accidents which cause the Symptoms of this various Disease.

HYSTEROMOTOCIA, or *Setio Casarea*, is a cutting the Child out of the Womb; which is done thus: You make a *Semi-lunar Section* under the Navel along the *Linea Alba*, the Cavity whereof looks towards the said Line; then according to the leading of the Fibres, the *Fœtus* being extracted after the Section, the Wound in the Womb contracts of it self, so that the Blood scarce flows more plentifully than in a Natural Birth; but if the Mother be dead, choose the most convenient Place you can. *Blanchard*.

HYSTEROTOMIA, is an Anatomical Dissection of the Womb,

I C E

JACOB'S-STAFF, a Mathematical Instrument for taking Heights and Distances; the same with *Crofs-staff*; which see.

IAMBUS, is a Foot of a Latin Verse, consisting of two Syllables, when the first is short, and the other long, as *Tēnax*.

JANITOR, the same with *Pylorus*.

JAUNDICE: see *Icterus*.

ICE: In *The Works of the Learned* for July, 1701, there is an Abridgment of a French Book, called *Nouvelle Conjecture pour expliquer la Nature de la Glace*; in which the Nameless Author modestly proposes the following Conjectures about Freezing and Ice.

Water freezes only because its Parts lose their Natural Motion, and cleave close to one another; but we must observe,

1. That the Water, whilst it freezes, seems to dilate it self, and that it becomes more light; whereas it should seem that it ought to become more weighty.

2. That frozen Water is not quite so transparent, and that the Bodies transpire not so freely thro' it as formerly; tho' one would think the contrary should happen, if it be true, that the Water dilates it self as it freezes. These are the seeming Contrarieties which are found in the Effects and Properties of Ice, that make the Nature of it obscure and difficult to be explained.

'Tis the common Opinion of Philosophers, That Ice is made by certain Spirits of Nitre, which in the Winter mix with the Parts of the Water, and being of themselves improper for Motion, because of their Figure and Inflexibility, inflexible and destroy gradually that of the Parts to which they are joined. This Opinion is supported by some

I C E

Experiments, which prove, at least, that on certain Occasions the Spirits of Salt and Nitre contribute to form the Ice.

Our Author has no Design to controvert those Experiments: He says only, That 'tis not certain that the Spirits of Nitre do always enter into the Composition of Ice; and that tho' they enter'd the same constantly, that alone would not be sufficient to explain all the Effects.

For Instance; We cannot conceive how the Spirits of Nitre, which enter the Pores of the Water, and fix the Parts of it, can oblige the Water to dilate it self, and make it more light; whereas Naturally they ought to augment the Weight of it. This Difficulty, and some others that might be insisted upon, shew the Necessity of a new System to explain the Nature of Ice: Therefore our Author gives this that follows, which he conceives explains all things with more Ease, and in a more simple manner, than the ordinary System.

He alledges, That Water freezes in the Winter, because its Parts being more closely joined together, they mutually embarrass one another, and lose all the Motion they had; and he supposes the Air to be the sole, or at least the principal Cause, why the Parts of the Water join so closely together. He explains it thus:

There are an infinite Number of small Parts of gross Air mixt among the Parts of the Water, as every Man may plainly perceive; for if we put into a Pneumatick Machine an open Vessel full of Water, in that same Proportion as you pump the Air out of the Machine, you will see the Water bubble up, and send forth a great Quantity of gross Air.

Those Parts of gross Air being dispersed among those of the Water, they have each of them the Virtue of a Spring; which is now so well proved in Natural Philosophy, that no Man will call it in question.

If then it can be shewed; That the small Springs of gross Air, mixed with the Water, have more Force in the Winter, and that then they unbend themselves a little; it would easily be conceiv'd, that on one side those Springs unbending themselves in that manner, and on the other the external Air continuing to press the Surface of the Water, the Parts of the Water shut up betwixt those small Springs which repulse them on all sides, must needs being locked up one against another, lose their Moisture, and form a hard Body, that is to say, *Ice*. All the Difficulty lies in this, How to know whether in reality the Springs of the Air, which are dispersed in the Water, unbend a little in the Winter; which 'tis easie to prove they do.

The gross Air, which we cannot perceive in the Water whilst it is Liquid, is easily seen when 'tis Frozen; we see then very often a great Quantity of Bubbles of Air very sensibly; and when they are too small to be observed every one apart, we may see them confusedly and in gross; for frozen Water is always a little whiter than 'twas before; and they that have studied any thing of the Nature of Colours, know that this Whiteness proceeds only from the small Bubbles of Air mix'd with the *Ice*. This is the Reason that all Scums are whitish, and that the Bubbles of Air mix'd with Glaſs or Chryſtal, appear whiter than the rest;

Add to this, That the little Bubbles of gross Air, which are absolutely insensible in the Water, so long as 'tis liquid, cannot become sensible in frozen Water, but because each of them becomes grosser than they were: And they cannot become grosser, but for one of these Reasons: Either because the Water, when it freezes, hath attracted new Air; or because the Air already dispersed in the Water, takes up a greater Space, and that its Springs are a little more unbended. We cannot conceive how the Water, as it freezes, could attract new Air, since the Pores of the *Ice* are certainly less than those of the Water, thro' which the gross Air cannot pass but with Difficulty. It must be then, that the Air already dispersed among the Parts of the Water, is dilated, and that the Springs are a little unbended.

But why, when 'tis cold, have the Springs of the Air more Strength to unbend themselves, than at another Season?

It is answered in the First place, That to establish this System here laid down, it is enough to prove that the Thing happens really so, without any Necessity of explaining the Cause of it.

Secondly, That this Cause is not very difficult to be found. Every one knows that Bodies with Springs have so much more Force as they are more stiff, and that they are so much the more stiff, as their Pores are less; but it is the Property of Cold to restrict the Pores: And during the Heat, the Pores are more open, because the subtil Matter which passes always thro' them, being then in a more violent Motion, hath the more Force to extend them and keep them open; whereas in the Winter, their Motion being much slackened, all the Bodies shut themselves up, and their Pores are straitened. Hence it comes, that in the Winter the Bodies of Animals transpire much less than in another Season. Since then the Cold locks up the least Parts of the gross Air, and makes them less pliable, and more stiff, because it straitens the Pores; we must say also, that it

augments the Force of their Springs, the Springs becoming more violent, according as the Body becomes more stiff.

Thus, during the Winter, the Springs of Air which are dispersed in the Water, having considerably more Force, they must unbend themselves a little, and as they unbend, they press against one another the small Parts of Water which they hold shut up.

This being supposed, there is nothing in *Ice* but what may be explained naturally enough.

1. That Water as it freezes, ought to make a hard Body, because then its Parts being pressed one against another, they embarrass one another mutually, and so lose all the Motion they had.

2. That Water as it freezes, ought to become more light; for tho' its Parts be more press'd than they were before, yet the Mass being composed of the Parts of the Water thus press'd, and of Air dilated, ought to be more large, and by consequence more light, than it was when the Water was liquid.

3. Frozen Water takes up a greater Space than when 'tis liquid, because the Springs of Air dispersed in the Water, by unbending themselves, do oblige the Water to rise in the Vessel which contain'd it. It is true, that the external Air presses also the Surface of the Water, and makes an Effort to repel it; but this external Air being freer, and its little Springs less bended, because they unbended themselves according as the Cold lock'd up the neighbouring Bodies, it hath less Force than that which is shut up in the Water, whose Springs cannot unbend, but by making the Bulk of the Water larger.

4. If you shut up a Vessel full of Water in the Pneumatick Machine, the Air dispersed in the Water dilates it self in an extraordinary manner when they pump the Air of the Machine; yet the Water freezes not, because the external Surface of the Water being no more press'd, the Air which it contains may, by unbending it self, escape freely, as in reality it does.

5. Frozen Water must always be less transparent than the same Water when it is liquid, because the Bubbles of Air which are insensible in the Water, by reason of their Smallness, being more sensible and large in the *Ice*, must also make it appear to be more white, and by consequence less transparent.

6. The Bodies must much less transpire through the *Ice*, than through the Water, because the Parts of the frozen Water are, in effect, more press'd than they were before, and so leave a less free Passage to foreign Bodies.

7. The Water, from which there is abundance of Air drawn by means of the Pneumatick Engine, must also freeze with less Difficulty; of which an able Man told our Author he had made the Experiment.

8. The Spirit of Wine, Brandy, and other Liquors of the same sort, cannot freeze at all, or at least rarely; for their Parts being in a great Motion, as appears by the Evaporation made of them, it follows, that the Air dispersed into the Parts of those Liquors, is much more subtil, and by consequence hath less of a Spring, than that which is dispersed in the Parts of common Water, since the Spring of the Air is principally in its gross Parts.

9. Oil, Fat, and other viscous Liquors, must congeal more easily than Water freezes, because their Parts being improper for Motion, do speedily embarrass one another; but those Liquors, when they congeal, cannot become so hard as *Ice*, nor dilate themselves in the same manner; for tho' they contain

contain among their Parts a greater Quantity of Air than Water does, yet that Air is more subtil, hath less Spring, and easily makes its way thro' the Pores of those Liquors.

10. Quick-silver cannot freeze, because it does not contain a great enough Quantity of gross Air; its Parts also are much polish'd, and they can easily slide one against another, without embarrassing or stopping one another.

11. According as the Cold grows more sharp, the Springs of the Air, dispersed in the Ice, ought to have more Force to repel the Parts of the frozen Water; and the Bulk composed of the Air and frozen Water, must needs grow larger and larger. This hath been proved in the following manner: They fill'd with Water an hollow Iron Bullet, which had a Hole of three or four Lines Diameter; the Water being frozen in that Bullet, and not being strong enough to break it, the Ice issued at the Hole, and form'd a sort of Stalk or Ice-sickle, which lengthened according as the Cold increased, and grew to the Length of a Finger; this Stalk being broke, and the Bullet exposed to the Air during a very cold Night, it made a new Stalk, but not so long as the former, the Ice's pining it self, if we may be allowed so to speak, as it passed through the Hole of the Bullet; as Gold and other Minerals do, by passing through the Wire-drawer's Instruments.

12. In the Hypothesis here laid down, the Spirits of Nitre may also contribute to form the Ice, in as much as by joining themselves to the small Parts of the Air dispersed in the Water, they contribute towards rendering them more stiff and inflexible, and to augment the Force of its Springs.

ICHOGRAPHY, in Perspective, is the View of any thing cut off by a Plane parallel to the Horizon, just at the Base or Bottom of it: And in Architecture is taken for the Geometrical Plan or Platform of an Edifice, or the Ground-plot of a House or Building delineated upon Paper, describing the Form of the several Apartments, Rooms, Windows, Chimneys, &c. And this is properly the Work of the Master-Architect or Surveyor, being indeed the most abstruse and difficult of any.

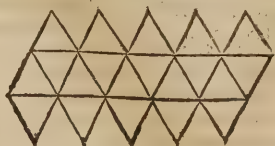
ICHOGRAPHY, in Fortification, is in like manner the Plane or Representation of the Length and Breadth of a Fortress, the distinct Parts of which are mark'd out either upon the Ground it self, or upon Paper.

ICHOR, is a sulphureous and watery Humour which flows from Ulcers. *Blanchard.*

ICHOROIDES, is a Moisture like Corruption.

ICOSIHEDRON: see *Regular Bodies*. This Solid consists of twenty *Triangular Pyramids*, whose Vertexes meet in the Center of a Sphere that is imagined to circumscribe it, and therefore have their Height and Bases equal: Wherefore the Solidity of one of those Pyramids, multiplied by 20, the Number of Bases, gives the solid Content of the *Icosihedron*.

The following Figure being drawn on Pastebord cut half thro', and then folded up neatly together, will represent an *Icosihedron*.



ICTERUS, the Jaundice, is a changing of the Skin into a Yellow Colour, from an Obstruction of the *Ductus Choledochus*, or the Glandules of the Liver, thro' Weakness, Obstruction, or a *Schirrus* of the Liver; or because the Gall abounds more than can be conveniently excreted, so that it stays in the Blood. The *Latins* call it, *Regius Morbus*, the Kingly Disease, because it is easily cured in Courts with the Pastimes and Diversions there which cheer the Mind. It is also called a Suffusion of the Gall. *Blanchard.*

IDEA, is whatsoever the Mind perceives in it self, or stands there for the immediate Object of any Phantasm, Notion, Species, Thought or Understanding.

IDENTITATE NOMINIS, is a Writ that lies for him, who upon a *Capias* or *Exigent*, is taken and committed to Prison for another Man of the Name.

IDEOTA *inquirenda vel examinanda*, is a Writ to the Escheator or Sheriff of any County, where the King hath Notice that there is an *Ideot*, Naturally born so weak of Understanding, that he cannot govern or manage his Inheritance, to call before him the Party suspected of the *Ideocy*, and examine him; and also by the Oath of Twelve Men, to inquire whether he be sufficiently witted to dispose of his own Lands with Discretion, or not, and to certify accordingly into the Chancery: For the King hath the Protection of his Subjects, and by his Prerogative, the Government of their Lands and Substance, that are naturally defective in their own Discretion.

IDES of a Month, among the *Romans*, were the Day after the *Nones* were out. They commonly fell out on the 13th of every Month, except in *March, May, July, and October* (which they called the *Full Months*, as all the others were called *Hollow*) for then they were on the 15th, because in those Months the *Nones* were on the 7th. The Etymology of the Word is variously given, and to be seen in most Dictionaries: See *Danet's Greek and Roman Antiquities*.

IDIOCRAZY, the proper Disposition or Temperament of a Thing or Body.

IDIOPATHY, is a primary Disease, which neither depends on, nor proceeds from any other.

IDIOSYNCRASY, is a Temperament peculiar to any particular Animal Body; whereby it hath, either in Sickness or in Health, a peculiar Aversion against, or Inclination for some particular Things; or on which some Things will have no such, or a more than usual Operation, than they will have on other Bodies.

JECAR-CAPSTAN: see *Capstan*.

JECUR, the same with *Hepar*.

JECUR Uterinum: see *Placenta Uteri*.

JEER, or *Jeer-Rope*, is a Piece of a Hawser fastened to the Main-yard and Fore-yard (in great Ships only) close to the Ties; then 'tis reeved thro' a Block, which is seized close to the Top, and so comes down again, and is reeved through another Block at the Bottom of the Mast close by the Deck; there are usually two of these, one on each side the Ties: Its Use is to help hoist up the Yard, but more especially to succour the Ties, and to keep the Yard from falling, if they should break.

JEJUNUM *Intestinum*, is the Second of the Small Guts, so called, because it is most times found empty: 'Tis in Length about Eight Foot in Men; it begins on the Right Side under the *Colon*, where the *Duodenum* ends, and fills a good Part of the Umbilical Region, especially on the Left Side;

'tis

'tis continued to the *Ileum*, but is easily known from it by its Emptiness, by the great Number of its Veins and Arteries, which make it look a little Reddish, and also because the Wrinkles in its Coats are more in number, and nearer to one another, than those in the *Ileum*, and the Coats themselves are much thicker.

JEOPAIL, in Common Law, signifies an Over-sight in pleading, touching which you have a Statute, 32 H. 8. 30. whereby it is enacted, That if the Jury have once past upon the Issue, tho' afterward there be found a *Jeopail* in the Pleading, yet Judgment shall likewise be given, according to the Verdict of the Jury.

JESSANT, when in a Coat of Arms a Lion or other Beast is born over some Ordinary, as over a Chief, a Bend, a Fesse, &c. that Lion or Beast is blazoned *Jessant* or *Jacent*, i. e. lying over all.

JET D'EAU, is the French Word for a Pipe of a Fountain, which casts up the Water any considerable Height into the Air.

Mr. Mariotte, in his Treatise *du Mouvement des Eaux*, &c. saith, That a *Fet d' Eau* will never rise so high as its Reservatory, but always falls short of it by a Space, which is in a subduplicate Ratio of that Height; and this he proves by several Experiments.

He saith also, That if a greater branches out in many smaller ones, distributed to different Jets, the Square of the Diameter of the main Pipe must be proportioned to the Sum of all the Expences of its Branches; and particularly saith, That if the Reservatory be 52 Foot high, and the *Adjutage* half an Inch in Diameter, the Pipe ought to be 3 Inches in Diameter.

JETSON: see in *Floſſon*.

IGNIS-FATUUS, is a certain Meteor that appears chiefly in the Summer-Nights, for the most part frequenting Church-yards, Meadows and Bogs, as consisting of a somewhat viscous Substance, or a fat Exhalation; which being kindled in the Air, reflects a kind of thin Flame in the Dark, yet without any sensible Heat, often flying about Rivers, Hedges, &c. because it meets with a Flux of Air in those Places. This Meteor is well known among the Common People, under the Name of *Will-of-the-Whisp*, or *Jack-with-a-Lantern*.

IGNIS PERSICUS, the same that *Gangrana*: it is taken also for a Carbuncle.

IGNIS ROTÆ: see *Wheel-fire*.

IGNIS SACER, the same that *Erysipelas*: Yet some take it for an *Herpes*.

IGNIS SYLVESTRIS, the same that *Phly-Elena*.

IGNITION, is Calcination made by Fire.

IGNORAMUS, in Law, is a Word used by the Grand Inquest, impannelled in the Inquisition of Causes Criminal and Publick, and written upon the Bill when they dislike their Evidence, as defective or too weak to make good the Presentment: The Effect of which Word so written is, That all farther Enquiry upon that Party, for that Fault, is thereby stopped, and he delivered without farther Answer.

I L E, is the Cavity from the *Thorax* to the Bones of the Thighs: *Pliny* observes, That all the Intestines in all Animals, except a Man and a Sheep, are called *Ile*. *Blanchard*.

I LEUM, is the Third of the small Guts, so called *ἀπὸ τῆς ἰλίου*, a *Circumvolvendo*, because of its many Turnings, &c. It begins where the *Jejunum* ends, and ends it self at the Gut called *Cecum*, at the Beginning of the *Colon*: It is about 21 Hands

Breadth in Length: There can be no such thing as twisting of the Guts, but sometimes the Coats being doubled inward, the upper Part of an Intestine sinks or falls with the lower, which makes the *Iliack Passion*, or *Volvulus*. The *Ileum* oft falls down into the *Scrotum*, and then the Rupture is called *Intestinalis*. The Passage of the *Ileum* is a little narrower than that of the *Jejunum*, and its Coats are somewhat thinner.

ILIA, the *Flanks* are the lateral Parts of the *Abdomen*, betwixt the last Rib and the Secret Parts.

ILIACK PASSION, the same with *Miserere*, or the Twisting of the Guts.

ILIACK VESSELS, are those double-forked Vessels of the Trunks of the great Artery, and the great Vein of the *Abdomen*, about the Place where the Bladder and the Womb are situate. *Blanchard*.

ILIACUS INTERNUS, is a Muscle of the Thigh, which arises fleshy from above half the Superior Region, and Internal Concave Part of the *Os Ilium*; and in its Descent over the Inferior Part of the last-named Bone, joins with the *Psoas Magnus*, and is inserted with it, partly under the Termination of the *Pectineus*: This, together with the *Psoas Magnus*, move the Thigh forwards in Progreſſion.

ILINGUS: see *Scoromia*.

ILIUM OS, is the first and upper Part of the Bone called *Ossa Innominata*, which are two large Bones situated on the sides of the *Os Sacrum*. This Part of it, *Ilium*, is so named, because it contains the Gut *Ilium*, which lies between it and its Fellow. Its Circumference is circular, being a little convex and uneven on its external side. 'Tis a large Bone, and is connected to the sides of the three superior *Vertebrae* of the *Os Sacrum*: The upper Part of it, of its Edge or Circumference, is called *Spina*, the Concave Internal Side *Costa*, and the External Convex one *Dorsum*: It is joined to the *Os Sacrum* by a true Suture: It is larger in Women than Men.

ILLUMINATIVE-MONTH, is that Space of Time that the Moon is visible to be seen betwixt one Conjunction and another.

IMAGE, in Opticks, is the Projection of an Object in the distinct Base of a Convex-glass.

To find the Diameter of an Image, in the distinct Base of a Convex-Glass, Mr. Molyneux gives this Rule.

As the Distance of the Object from the Glass:
To the Distance of the Image from the Glass::
So the Diameter of the Objects Magnitude:
To the Diameter of the Image.

Wherefore, if the Diameter of the Sun subtend an Arch of 32 Minutes of a Great Circle in the Heavens, the Diameter of the Sun's Image represented in the distinct Base of a Convex Glass, subtends an Arch of 32 Minutes also of such a Circle as hath for its Radius the Distance of the distinct Base from the Glass.

IMAGINATION, is an Application of the Mind to the Phantasm or Image of some Corporeal Thing impressed in the Brain.

IMBRICATED, is a Word used by Mr. Tournefort, and some other Botanists, to express the Figure of the Leaves of some Plants, which are hollowed in like an *Imbrex*, or Gutter-Tile.

IMMENSE,

IMMENSE, is that whose Amplitude or Extension no Finite Measure whatsoever, or how oft soever repeated, can equal.

IMMERSION, the Plunging of any thing under Water; 'Tis also used by Astronomers, to signify that any Planet is beginning to come within the Shadow of another, as in Eclipses, whenever the Shadow of the Eclipsing Body begins to fall on the Body Eclipsed, we say, that is the time of *Immersion*; and when it goes out of the Shadow, is the Time of *Emergence*.

IMMERSUS: see *Subcapularius*.

IMMUTATION: see *Hypallage*.

IMPALED, when the Coats of a Man and his Wife (who is not an Heiress) are born in the same Escutcheon; they must be Marshallled in *Pale*, the Husband's on the Right side, and the Wives on the Left; and this the Heralds call *Baron and Femme*, two Coats Impaled.

If a Man hath had two Wives, he may Impale his Coat in the middle between theirs; and if he hath had more than two, they are to be Marshallled on each side of his, in their proper Order. See *Clifford's Coat* in *Guillim*, p. 399. who had seven Wives.

IMPARLANCE, or *Emparlance*, is a Motion made in Court upon the Account of the Demendant by the Tenant, or Declaration of the Plaintiff by the Defendant, whereby he craveth Respite, or any other Day to put in his Answer.

This Imparlance is either *General* or *Special*.

The *Special* is with this Clause, *Salvo omnibus advantageis tam ad jurisdictionem curie quam breve & narrationem*.

The *General* is made at large, without inserting that or any other like Clause.

IMPENETRABILITY, is the Distinction of one extended Substance from another, by which the Extension of one thing is different from that of another; so that two things extended, cannot be in the same Place, but must of Necessity exclude each other.

IMPERATIVE-MOOD (in *Grammar*) implies a Command to such a one to do such a thing.

IMPERFECT CONCORDS: see *Concords*.

IMPERFECT Flowers of Plants, are such as want the *Petala*, or those finely coloured little Leaves which stand round and compose the Flower: And therefore they are sometimes called *Apetalous*, and sometimes *Stamineous*; because they have only the *Stamina* and *Style* of a Flower.

IMPERFECT NUMBERS, are such whose Aliquot Parts taken altogether, do either exceed, or fall short of that Whole Number, of which they are Parts: And these are of two sorts, either *Abundant* or *Deficient*; which see.

IMPERFECT PLANTS, are by the Botanists accounted such as either really want Flower and Seed, or rather seem to want them; since no Flower or Seed hath yet been discovered to belong to much the greatest part of them.

These Mr. Ray distinguishes according to the Place of their Growth; into,

I. *Aquaticks*, or such as grow in the Water; and that either in the Sea, and then they are called

Marine Plants; and those are either of an hard and stony Consistence, as the *Coral*, *Corallines*, *Porus*;

Or of a more Soft and Herbaceous one.

Of these some are like Herbs, and are of two Kinds:

The Greater, which are *Cauliferous*, as the *Fucus*,

The Lesser, as the *Alga*.

The others are more of the *Musci* or *Fungus* Appearance, as the *Spongia*.

Fresh-water Plants, and those have either no Leaves, but are *Capillaceous*, as the *Conserve*;

Or their Leaves divided into three Parts; as the *Lent palustris*, *Lenticula*.

II. Such *Imperfect Plants*, as inhabit the dry Ground, he divides into,

First, Such as have a Substance, either Woody, or Flethy; and these have scarce any thing common to the Perfect Plants, neither the Green Herbaceous Colour, nor the Texture of Herbs, nor Flower, Seed, nor Leaf, properly speaking, as all the *Fungi*; which are,

1. Such as grow on Trees, and therefore called *Arboreous*; as the *Fungus Laricis*, called *Agarick*, and the *Fungus Sambuci*, which we call *Jews-Ear*, *Auricula Juda* in *Latin*.

2. *Terrestrial*; and these are either *Cauliferous*, with Heads either *Lamellated*, or *Porose* underneath; or without Stalks, as the *Pezize* of *Pliny*, and *Fungus Pulverulentus*, *Crepitus Lupi*, or common *Puff-Balls*.

3. *Subterraneous*; as the *Tubera Terra*, or *Truffles*.

Secondly, Such as have a more soft and dry Consistence, and more like that of Herbs: Of which some are both *Cauliferous* and Branched, as the *Musci* or *Mosses*.

Others are without Stalks, adhering like a Crust to the Surface of the Earth, Stones, Trees, or Wood; as the *Lichen Terrestris* and *Arboreus*.

IMPERIAL-TABLE, is an Instrument made of Brass, with Box and Needle, and Staff, used to measure Land: see *Vol. II*.

IMPERSONAL-VERB, in *Grammar*, is such an one as is only used in the Third Person Singular, as *Oportet*, *Licet*, &c.

IMPERVIOUS: Bodies are said to be Impervious to others, when they will neither admit the Rays of Light, &c. nor the Effluvia of other Bodies to pass thro' them.

IMPETIGO CELSI, the same with *Lepra Graecorum*. *Celsus* makes four sorts of it :

The most harmless, says he, is that which is like a Scab, for it is red and hard, exulcerated and gnawed : But it differs from it, in that it is more exulcerated, and is accompanied with speckled Pimples : And there seem to be in it certain Bubbles, from which after a certain time there fall, as it were little Scales, and it returns more certainly.

Another sort is worse, almost like a sort of Meazles, or hot Pimples in the Skin, but more rugged, and redder, and of different Figures : In this Distemper little Scales too, fall from the Surface of the Skin, and it is called *Rubrica*.

The third sort is yet worse ; for it is thicker and harder, and swells more, and is cleft on the top of the Skin, and gnaws more violently : It is Scaly too, but black, and spreads broad and slow : It is called *Nigra*.

The fourth sort is altogether incurable, of a different Colour from the Red ; for it is something white, and like a fresh Scar, and has pale Scales ; some whitish, some like the little Pulse called *Lintel*, which being taken away, sometimes the Blood follows : Otherwise the Humour that flows from it is white, the Skin hard and cleft, and spreads farther.

All these sorts arise especially in the Feet and Hands, and infest the Nails likewise.

Impetigo some reckon the same with *Lichen*, *Blanchard*.

IMPETIGO PLINII, *Pliny's Impetigo*, is the same with *Lichen Graecorum*. *Blanchard*.

IMPROPER FRACTIONS, are such as have their Numerators equal to, or greater than their Denominators, as $\frac{7}{4}$, $\frac{11}{3}$, &c. which are not Fractions properly speaking, but either Whole or Mixt Numbers ; and are only put into the Form of Fractions, in order to be added, subtracted, multiplied, or divided, &c.

INACCESSIBLE HEIGHT or *Distance*, is that which cannot be Measured, by reason of some Impediment in the Way ; as Water, &c.

INADEQUATE IDEA'S, are such, which are but a partial, or incomplete Representation of those Archetypes or Images to which the Mind refers them.

INANITY, is the School-Term for Emptiness or absolute Vacuity, and implies the Absence of all Body and Matter whatsoever ; so that nothing remains but bare Space.

INCALESCENCE, is a Thing growing hot by some Internal Motion, or Fermentation ; as when Quick-lime grows hot by pouring Water upon it.

INCALESCENT MERCURY, so *Mr. Boyle* calls some Mercuries of an uncommon Preparation, which by being mingled with a due Proportion of Gold Leaves, or small Fillings, would Amalgamate and grow hot with the Gold, even in the Palm of our Hand.

IN CASU CONSIMILI, is a Writ : see *Casu Proviso*.

IN CASU PROVISIO, is a Writ : see *Casu Proviso*.

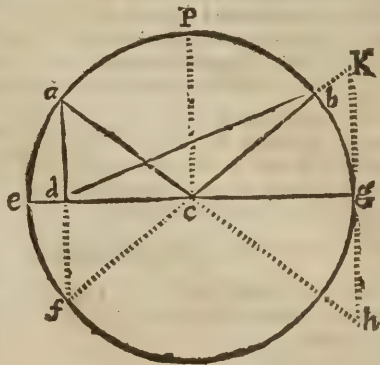
INCEPTIVE of *Magnitude*, is a Word used by *Dr. Wallis*, expressing such Moments or first Principles, as tho' of no Magnitude themselves, are yet capable of producing such. Thus a point hath no Magnitude it self, but is Inceptive of a Line, which it produces by its Motion : A Line considered one way, hath no Magnitude as to Breadth, but is capable by its Motion of producing a Surface which hath Breadth, &c.

INCERATION, is a mixture of Moisture with something that is dry, by a gentle soaking, till the Substance be brought to the Consistence of Soft Wax. *Blanchard*.

INCIDENCE. In Opticks, the Angle $a c P$, made by the Ray $a c$, and the Perpendicular $P c$, is called the *Angle of Incidence* ; but *Dr. Barrow*, and some others, call it the *Angle of Inclination* ; and by the *Angle of Incidence*, they understand its Complement $e c a$.

Mr. Molyneux, in his *Dioptricks* uses the Words *Inclination* and *Incidence* promiscuously, and by the *Angle of Incidence* or *Inclination*, always intends the first named Angles $a c P$.

The Angle $P c b$, is called, *The Angle of Reflexion*, and is always $=$ to the Angle of Incidence $a c P$: Which is thus proved by *Leibnitzius*.



Every Ray of Light goes the shortest way that possibly it can : But if you suppose the Ray $a c$ to fall on the Plane-Glass, or Surface $e g$, and thence to be reflected to b , so that the Angle $a c e$ be $= b e g$, then will the two Lines $a c$ and $c b$ be the two shortest Lines that can possibly be drawn from the Points a and b , to the Plane $e g$: For Instance, they will be shorter than $a d + d b$, or any others.

Produce $c b$ to f , and draw $d f$, because the opposite Angles at c are ; the Arch $e f (= b g) = a e$ by the Supposition ; but 'tis plain that $f c = a c$, and $c f = c b$. Wherefore $f b (= a c + c b)$ will be less than $d f$ (i. e. $a d$) $+ d b$: and so it will be every-where else. Wherefore since the Ray must go the nearest way, the Angle of Incidence will always be $=$ to that of Reflexion : For the two Angles $e c a$ and $b c g$, being thus equal, their Complements $a c P$ and $P c b$ must be so too.

That the Angle of Incidence $a c P$, is $=$ to that of Reflexion $P c b$, may very briefly be thus proved.

Produce the Ray $a c$ directly till it meet with the Perpendicular $g b$ in the Point b : Then make $c R = g b$, and draw $c K$: I say $c K$ is the Reflected Ray, and that the Angle $P c k = r c P$: For $P b$ being drawn perpendicular to the Plane $e g$, the Angle $e c a + a c P = K c g + P c K$, because both are $= L$: But $e c a = g c b$, because Vertical and $c g b = g c K$ by Construction. Wherefore $e c a = b e g$: And consequently their Complements $a c P$ and $P c b$ are equal. Q. E. D.

In *Dioptricks*, the Sines of the Angles of Incidence, and Reflected Angles, are to each other reciprocally, as the Resistances of the Mediums, as is demonstrated

strated by *Leibnitz* in *Acta Erud. Lipsie. Anno 1682.* p. 185. And in *Mr. Moineux's Dioptrica Nova,* Part II. Chap. I.

Sir *Isaac Newton* discover'd, That from Air to Glass, the Sine of the Angle of Incidence: is to the Sine of the Refracted Angle :: as 300: 10 193, or nearly, as 14 to 9.

And on the contrary, That from Glass to Air, the Sine of the Incidence: is to the Sine of the Refracted Angles :: as 193: to 300, or as 9 to 14.

But in his *Dissertations concerning Light and Colours*, he has demonstrated, that the Rays of Light are not all *Homogeneous*, or of the same sort, but of different Forms and Figures; so that some are more Refracted than others, tho' they have the same or equal Inclinations on the Glass; And therefore there can be no constant Proportion set between the Sines of the Incident, and Refracted Angles.

But the Proportion that comes nearest the Truth, for the middle and strong Rays of Light, is nearly as 300 to 193, 14 to 9.

INCIDENCE-POINT, (in Opticks) is that Point in which a Ray of Light is supposed to fall on a Piece of Glass.

INCIDENT-RAY, in *Catoptricks* and *Dioptricks*: see *Ray of Incidence*.

INCINERATION, is the Reducing the Bodies of Vegetables and Animals into Ashes by a violent Fire.

INCISIVUS, is a Muscle which pulleth the Upper Lip upwards.

INCISORES DENTES, the same with *Primores*.

INCISIVI, the same with *Primores*.

INCLINATION, is a Word frequently used by Mathematicians, and signifies the mutual Approach, Tendency or Leaning of two Lines or two Planes towards each other, so as to make an Angle.

What the *Angle of Inclination* signifies in Opticks, see in *Incidence*.

The *Inclination* of two Planes, is the acute Angle made by two Lines, drawn one in each Plane, and perpendicular to their *Common Section*.

INCLINATION of the Axis of the Earth, is the Angle which it makes with the Angle of the Ecliptick; or the Angle between the Planes of the Equator and Ecliptick.

INCLINATION of a Planet, is an Arch of the Circle of Inclination, comprehended between the Ecliptick and the Place of a Planet in his Orbit.

INCLINATION of a Plane, in Dialling, is the Arch of a Vertical Circle, perpendicular to both the Plane and the *Horizon*, and intercepted between them.

To find the Inclination of a Plane,

Take a Quadrant, and apply its Side to the Side of a Square, and apply the other Side of your Square to your Plane; if the Plummer fall parallel to the Side of the Square, then the lower Side of the Square stands level; by which draw an Horizontal Line, whereon erect a Perpendicular, and apply your Square to that Perpendicular, and if the Plummer falls parallel to the Side of the Square, then that is also a level Line, and your Plane stands Horizontally: If the Plummer falls not parallel to the Side of the Square, then turn your Square until it does, and draw an Horizontal Line, on which erect a Perpendicular, to which apply your Square, and observe what Angle your Plummer makes on the Quadrant, with the Side of the Square; that is, the Angle of the Inclination of the Plane,

INCLINATION of a Ray, in *Dioptricks*, is the Angle which this Ray makes with the *Axis of Incidence* in the first Medium, at the Point where it meets the second Medium.

INCLINATION of a Right Line to a Plane, is the acute Angle which this Right Line makes with another Right Line drawn in the Plane, through the Point where the inclined Line intersects it, and thro' the Point where it is also cut by a Perpendicular drawn from any Point of the inclined Lines.

INCLINATIONS of the Planes of the Orbits of the Planets, to the Plane of the Ecliptick, are thus: *Saturn's* Orbit makes an Angle of 2 Degrees 30 Minutes; *Jupiter's* 1 Degree; and $\frac{1}{2}$; *Mars's* little less than 2 Degrees; *Venus's* is 3 Degr. and $\frac{1}{2}$; *Mercury's* is almost 7 Degrees.

INCLINING Direct South or North Dials: see *Direct South or North Inclining Dials*.

INCLINING Declining Dials: see *Declining Inclining Dials*.

INCLINING Planes, are those which lean or incline to the Horizon.

INCOMMENSURABLE Numbers, are such as have no Common Divisor that will divide them both equally.

INCOMMENSURABLE Quantities, are those which have no Aliquot Parts, or any Common Measure that may measure them; as the *Diagonal* and Side of a Square: for altho' that each of those Lines have infinite Aliquot Parts, as the Half, the Third, &c. yet not any Part of the one, be it never so little, can possibly measure the other, as is demonstrated in 117. El. 10. Eucl.

INCOMPLEX Terms in Logic: see *Complex*.

INCONGRUITY: see *Congruity*.

INCORPORATE: To *Incorporate*, in Chymistry or Natural Philosophy, signifies accurately to mix the Particles of one Body with another.

INCRASSATING, or thickening things, are those which being endued with thick rosy Parts, and mixed with thin liquid Juices, bring them to a thicker Consistence, by joining and knitting their Parts together. *Blanchard*.

INCUBUS: see *Ephialtes*.

INCUMBENT, in Common Law, is a Clerk resident on his Benefice with Cure; and called *Incumbent* of that Church, because he doth, or ought to bend his whole Study to discharge his Cure.

INCURVATION of the Rays of Light: see *Light and Refraction*.

INCUS, the Anvil, is a Bone of the inner Part of the Ear: It is like a Grinder-tooth, and lies under the Bone called *Malleus*. It has two Legs, the shorter of which is tied to the Side of that Conduite or Passage which goes to the *Processus Mammillaris*; and the longer Leg to the Head of the third Bone, called the *Stapes*.

INDAGATOR, a Searcher or Inquirer into Nature.

INDEFINITE, is what hath no Bounds or Limits determined; or what is considered as not having any.

INDENTED, a Term in Heraldry, when the Outline of a Bordure, Ordinary, &c. is in the Form of the Teeth of a Saw: Thus;



INDENTURE, is a Writing comprising some Contract between two, and being *indented* in the Top answerable to another, that likewise containeth the same Contract.

INDETERMINED Problem in Geometry: see *Local*.

INDEX, is the same with what is sometimes called the *Characteristick* or Exponent of a Logarithm; and sheweth always of how many Places the Absolute Number belonging to the Logarithm doth consist, and of what Nature it is; *i. e.* whether an Integer, or a Fraction: Thus; In this Logarithm 2.562293, the Number standing on the Left-hand of the Point, is called the *Index*; and because it is 2, shews you that the absolute Number answering to it, consists of 3 Places; for 'tis always one more than the Index, because the Index of 1 is 0; of 10 is 1; of 100 is 2, &c.

As in this Example;

0 1 2 3 4 5 6 7 8 9

1 2 3 4 5 6 7 8 9

Where the upper Numbers are Indices to the lower. And therefore in those small Tables of *Briggs's* Logarithms, where the Index is omitted, it must always be supplied before you can work by them. If the absolute Number be a Fraction, then the Index of the Logarithm hath a negative Sign, and is marked thus, 2.562293; which shews the corresponding Number to be a Decimal Fraction of 3 Places, *viz.* 1.365.

Mr. *Townly* hath a peculiar way of noting these Indices, when they express Fractions, and 'tis now much in Use, *viz.* by taking instead of the true Index, its Arithmetical Complement to 10; and therefore he would write the Logarithm now mention'd thus, 8.562293. How they are added and subtracted, see in *Addition* and *Subtraction*.

INDICATION, a Word used by Physicians and Surgeons, and signifies a Discovery of what is to be done, and what Course is to be taken for the Recovery of the Patient's Health; as if on Examination Bleeding be found necessary, they say, Bleeding is indicated.

INDICATIONS are usually accounted Threefold:

1. *Preservatory*, which shew what is to be done for the Continuation and Preservation of Health.

2. *Curative*, which shew how the Disease is to be removed, that the Patient at present labours under.

3. *Vital*, which respect the Patient's Life, Strength and way of Living.

INDICATIVE-MOOD, in Grammar, demonstrates simply what we affirm.

INDICATOR; see *Extensor Indicis*.

INDICAVIT, is a Writ or Prohibition, that lieth for a Patron of a Church, whose Clerk is Defendant in Court-Christian, in an Action of Tythes commenced by another Clerk, and extending to the fourth part of the Church, or of the Tythes belonging to it; for in this Case the Suit belongeth to the King's Court; wherefore the Patron of the Defendant being like to be prejudiced in his Church and Advowson, if the Plaintiff obtain in the Court-Christian, hath this Means to remove it to the King's Court.

INDICTION: see *Cycle of Indiction*.

INDICTMENT: see *Enditement*.

INDIGNATORIUS, an Epithet attributed to the fourth streight Muscle of the Eye, because that Motion or Cast of the Eye is peculiar to Men in the Passion of Anger. For this Muscle being one of the *Abducent*, serves to draw the Eye outward from the inner Corner to the outer.

INDIVIDUUM, in *Logick*, is that which signifies but one only thing: Of which they make a fourfold Division.

1. *Individuum Vagum*, is that which tho' it signifies but one Thing, yet may be any of that kind; as when we say, *A Man, A certain Person, or One* said so or so; tho' but one Person is meant, yet that one Person, for ought appears to the contrary, may be any Body.

2. *Individuum Determinatum*, is when the Thing is nam'd or determin'd; as *Alexander*, the River Nile, or Mount *Abois*: This also is called *Signatum*.

3. *Individuum Demonstrativum*, is when some Demonstrative Pronoun is used in the Expression; as *This Man, That Woman*.

4. *Individuum ex Hypothesi*, or by Supposition; when an universal Name or Term is restrained by the Supposition to a particular Thing; as when we say, the *Son* of such an one, and it be known that he had but one Son.

INDIVISIBLES, in Geometry, are such Elements or Principles as any Body or Figure may ultimately be resolv'd into. And these *Elements* or *Indivisibles*, are in each peculiar Figure supposed to be infinitely small.

With regard to which Notion, a Line may be said to consist of Points; a Surface of Parallel-Lines, and a Solid of Parallel and Similar Surfaces: And then, because each of these Elements is supposed Indivisible, if in any Figure, a Line be drawn thro' the Elements perpendicularly, the Number of Points in that Line, will be the same as the Number of the Elements.

Whence we may see, that a Parallelogram, Prism or Cylinder, is resolvable into Elements, or Indivisibles, all equal to each other, parallel, and like to the Base. A Triangle into Lines parallel to the Base, but decreasing in Arithmetical Proportion, and so are the Circles which constitute the *Parabolick Conoid*, and those which constitute the Plane of a Circle, or the Surface of an Isoleles Cone.

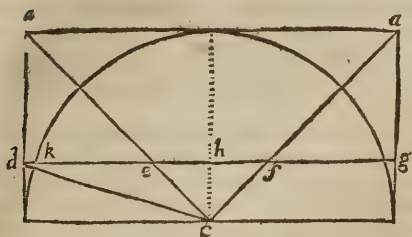
A Cylinder may be resolv'd into Cylindrical Curve Surfaces, having all the same Height, and continually decreasing inwards, as the Circles of the Base do, on which they insit.

This Method of *Indivisibles*, is only the Ancient Method of *Exhaustions* a little disguised and contracted: It was first introduced by *Cavalieri* in his *Geometria Indivisibilium*, Anno Dom. 1635. pursued after by *Torricellius* in his Works, printed 1644. and again by *Cavalieri* himself in another Treatise, published 1647. And is now allowed to be of excellent Use in the shortening of Mathematical Demonstrations: Of which take the following Instance in that famous Proposition of *Archimedes*;

That *A Sphere is two thirds of a Cylinder circumscribing it.*

For suppose (as in the Figure) a Cylinder, Hemisphere, and an Inverted Cone, to have the same Base and Altitude, and to be cut by Infinite Planes all parallel to the Base, of which *dg* is one: 'Tis plain, the Square of *dh* will every where be equal to the Square of *KC* (the Radius of the Sphere) the Square *bc* = *eb* Square; and consequently, since Circles are to one another, as the Squares of the Radii,

Radii, all the Circles of the Hemisphere will be equal to all those of the Cylinder, deducting thence



all those of the Cone : Wherefore the Cylinder, deducting the Cone, is equal to the Hemisphere ; but 'tis known, the Cone is one third of the Cylinder, and consequently the Sphere must be two thirds of it. Q. E. D.

INDUCTION, is commonly taken for the giving Possession to an Incumbent of his Church, by leading him into it, and delivering him the Keys, by the Commissary or Bishop's Deputy, and by his ringing one of the Bells.

INDURANTIA : see *Sclerotica*.

INDUSIUM : see *Ammios*.

INEDIA, is abstaining from Meat, when one eats less than formerly.

INEFFABLE-NUMBERS, the same with *Surd-Numbers*.

INEQUALITY of Natural Days. Tho' the Sun is supposed vulgarly to measure our Time equally, yet he is very far from doing so : And as 'tis impossible for a good Clock, or Movement, to keep Time with the Sun ; so one that is truly such, will measure Time much more truly, and go exacter than any Sun-Dial.

The usual Reason, and one good one it is, of the Inequality of Natural Days, you have under the Word *Equation of Time* : But the Truth is, there is also another ; and that is, That the Motion of the Earth it self, round its Axis, is not exactly Equable or Regular, but is sometimes swifter, and sometimes slower.

INERGETICAL Bodies or Particles, are such as are sluggish and unactive.

INESCUTCHEON, in Heraldry, signifies all the Escutcheons, containing $\frac{1}{4}$ of the Field, and is born within it as an Ordinary, thus :



He beareth *Ermin*, an *Escutcheon Gules*.

This is also sometimes called, An *Escutcheon of Pretence* ; which is born when a Man marries an Heir-ess : For then he bears her Coat of Arms on an *Escutcheon*, or *Escutcheon of Pretence*, in the Middle of his own Coat.

INFERNAL-STONE, or *Perpetual Caustick*, is a Chymical Operation, whereby Silver is rendred *Caustick* by the Salts of Spirit of Nitre.

'Tis thus made ;

Dissolve in a Vial any Quantity of Silver in thrice its Weight of Spirit of Nitre ; and then in a Sand-heat evaporate $\frac{2}{3}$ of the Moisture : The Remainder put into a good large *German Crucible*, which place over a gentle Fire ; let the Matter alone, and heaving 'till at last it sinks quietly to the Bottom : Then increasing the Fire a little,

'twill turn into an Oil ; and as soon as you perceive it to be so, it must immediately be poured into an Iron-mold, purposely made for it, that is a little oil'd and greas'd, where it will presently coagulate and harden. After 'tis taken out, it must be kept in a Vial well stop'd ; 'tis a great *Caustick*, and will last for ever, if it be kept from the Air. Some make them of Copper, but those are not so good as these.

INFIMUS VENTER : see *Abdomen*.

INFINITE, is that which has no Bounds, Terms, nor Limits.

INFINITE QUANTITY. Of the several Species of Infinite Quantity, and of the Proportions they bear one to the other, the learned Mathematician Capt. Halley, in *Philosoph. Transactions*, N. 193, gives the following Account :

That all Magnitudes infinitely great, or such as exceed any assignable Quantity, are equal among themselves, though it be vulgarly received for a Maxim, is not yet so common as it is erroneous ; and the Reason of the Mistake seems to be, That the Mind of Man coming to contemplate the Extensions of what exceeds the Bounds of its Capacity, and of which the very Idea does include a Negation of Limits ; it comes to pass, that we acquiesce generally, and it suffices to say, such a Quantity is *Infinite*.

But if we come more nearly to examine this Notion, we shall find, that there are really besides *Infinite Length*, and *Infinite Area*, no less than three several sorts of *Infinite Solidity* : All of which are *Quantitates sui generis*, having no more Relation or Proportion the one to the other, than a Line to a Plane, or a Plane to a Solid, or a Finite to an Infinite ; but that among themselves each of these Species of *Infinities*, are in given Proportions, is that which is to be made plain.

But first, *Infinite Length*, or a Line infinitely long, is to be considered, either as beginning at a Point, and so infinitely extended one way, or else both ways from the same Point ; in which case the one, which is a beginning *Infinity*, is the one half of the whole, which is the Sum of the beginning and ceasing *Infinity*, or of *Infinity a parte ante*, and a *parte post*, which is analogous to Eternity in Time or Duration, in which there is always as much to follow as is past from any Point or Moment of Time : Nor doth the Addition or Subduction of finite Length or Space of Time alter the Case, either in Infinity or Eternity, since both the one and the other cannot be any Part of the Whole.

As to *Infinite Surface* or *Area*, any Right Line infinitely extended both ways on an infinite Plane, does divide that infinite Plane into equal Parts, the one to the Right, and the other to the Left of the said Line : But if from any Point in such a Plane, two Right Lines be infinitely extended, so as to make an Angle, the infinite Area, intercepted between those infinite Right Lines : is to the whole infinite Plane :: as the Arch of a Circle, on the Point of Concourse of those Lines as a Centre, intercepted between the said Lines : is to the Circumference of the Circle ; or as the Degrees of the Angle, to the 360 Degrees of the Circle.

For Example,

Two Right Lines meeting at a Right Angle, do include, on an infinite Plane, a quarter Part of the whole infinite Area of such a Plane.

Bur

But if so be two parallel infinite Lines be supposed drawn on such an infinite Plane; the Area intercepted between them will be likewise infinite; but at the same time will be infinitely less than that Space which is intercepted between two infinite Lines that are inclined, tho' with never so small an Angle; for that in the one Case, the given finite Distance of the Parallel Lines, diminishes the Infinity in one Degree of Dimension; whereas in a Sector, there is Infinity in both Dimensions; and consequently the Quantities are the one infinitely greater than the other, and there is no Proportion between them.

From the same Consideration arise the three several Species of infinite Space or Solidity, as has been said; for a Parallelopiped or a Cylinder infinitely long, is greater than any finite Magnitude, how great soever; and all such Solids supposed to be formed on given Bases, are as those Bases, in proportion to one another: But of these, three Dimensions are wanting, as in the Space intercepted between two parallel Planes infinitely extended, and at a finite Distance; or with infinite Length and Breadth with a finite Thickness; all such Solids shall be as the given finite Distances one to another; but these Quantities, tho' infinitely greater than the other, are yet infinitely less than any of those wherein all the three Dimensions are infinite. Such are the Spaces intercepted between two inclined Planes infinitely extended; the Space intercepted by the Surface of a Cone, or the side of a Pyramid likewise infinitely continued, &c. of all which, notwithstanding the Proportions one to another, and to the vast Abyss of infinite Space, (wherein is the Locus of all things that are or can be; or to the Solid of infinite Length, Breadth and Thickness taken all manner of ways) are easily assignable. For the Space between two Planes: is to the whole: as the Angle of those Planes: to the 360 Degrees of the Circle.

As for Cones and Pyramids, they are as the Spherical Surface intercepted by them, is to the Surface of the Sphere; and therefore Cones are as the Versed Sines of half their Angles to the Diameter of the Circle. These three sorts of *Infinite Quantity*, are analogous to a Line, Surface, and Solid, and after the same manner cannot be compared, or have no proportion the one to the other.

Besides these, there are also several other Species of *Infinite Quantity*, arising from the Contemplation of Curves, and their Asymptotes, which he leaves to the Speculation of the learned Mathematicians.

INFINITE SERIES: see *Series*.

INFINITIVE-MOOD, in Grammar, is when a Verb is used so as to determine neither any particular Person, or Number.

INFLAMMATIO: see *Pblegmone*.

INFLATION, is the Distention of a Part from its natural Matter.

INFLECTION (in Opticks) is a Multiplicate Refraction of the Rays of Light, caused by the unequal Density of any Medium, whereby the Motion or Progress of the Ray is hindered from going on in a Right Line, and is Inflected or Deflected by a Curve, saith the ingenious Dr. Hook, who first took notice of this Property in his *Micrography*, p. 217. And this he saith, differs both from Reflection and Refraction, which are both made at the Superficies of the Body, but this in the middle of it within.

Sir Isaac Newton, as you will find under the Word *Light*, discovered also by plain Experiment this Inflection of the Rays of Light; and Mr. de la Hire saith he found, That the Beams of the Stars being observed in a deep Valley, to pass near the Brow of

an Hill, are always more refracted than if there were no such Hill, or the Observations were made on the Top thereof; as if the Rays of Light were bent down into a Curve, by passing near the Surface of the Mountain—See Vol. 2.

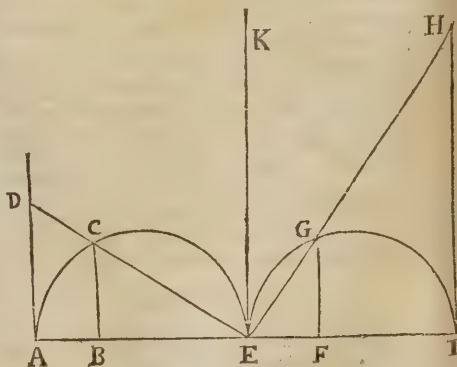
INFLECTION-POINT of any Curve, in Geometry, signifies the Point or Place where the Curve begins to bend back again a contrary way: As for Instance;

When a Curve-Line, as *AFK*, is partly Concave and partly Convex towards any Right-Line, as *AB*, or towards a fix'd Point, then the Point *F*, which divides the Concave from the Convex Part, and consequently is at the Beginning of one, and End of the other, is called the Point of *Inflection*, as long as the Curve, being continued in *F*, keeps its Course the same; but 'tis called the Point of *Retrogression*, when it inflects back again towards that Part or Side from whence it took its Original: See the next Figure save one.

Before the Theory of this Inflection and Retrogression of Curves can be understood, a certain Principle must be explain'd, which is this, as communicated by Mr. Dutton.

Whatsoever finite Quantity (or if it be a Fluxion 'tis all one) goes on continually increasing or decreasing, it cannot change from a Positive to a Negative Expression, or from a Negative to a Positive one, without first becoming equal to an Infinite, or to Nothing: It is equal to Nothing, if it does continually decrease, and equal to an Infinite, if it does continually increase.

To illustrate this, Let there be two Circles touching one another in the Point *E*, their Diameters *AE* and *EI*, lying in one and the same Right-Line. Let *AE* or *EI* be $= d$. Let the Distance between the Extremity *A*, and any Ordinate in either of the Circles be $= x$ perpetually. I consider now, what will be the Expressions of the Lines intercepted between *E* the Point of Contact of the Circles; such as are the Lines *EB* and *EF* intercepted between *E* and the Ordinates *CB* and *GF*. 'Tis certain therefore, That taking a Point, as *B*, any where between *A* and *E*, that then the Expression of the intercepted *EB* is $d - x$; but taking a Point, as *F*, between *E* and *I*, the Expression of the intercepted *EF*, shall be $x - d$. For *AB*, or



AF being taken for x indifferently, the Values of the intercepted Lines will appear with this Change of Signs.

In one Case therefore the Expression is Positive, in the other Negative. But as the points *B* or *F* approach to *E*, the Quantities *BE* and *EF* decrease continually, and at the point *E* are equal to nothing.

So that it is plain, That there is no passing from a Positive to a Negative Expression, in this Case of a Quantity continually decreasing, without passing thro' nothing. For the other part,

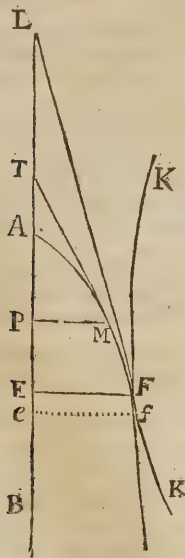
Let us consider the Tangents (as *DA* or *HI*) cut off by Lines continually drawn from *E* the point of the Circles contact. If *CB*, or *GF*, be put equal to *y*, the Expression of any such Tangent will be $\frac{y}{d-x}$ or $\frac{y}{x-d}$, according as we take it

on the one or the other side of the point *E*; in one Case therefore 'tis Positive, in the other Negative. But as the Points *B* or *F* approach to *E*, the Tangents *DA* and *HI* increase continually, and at the Point *E* they become infinite: Therefore a Quantity that continually encreaseth, cannot pass from a Positive to a Negative Expression, without being infinite.

All this is Universally True, whether it be a Finite Quantity or a Fluxion that we consider. There is no changing from Positive to Negative, without passing thro' Nothing or Infinite.

Applying this therefore to Fluxion, it will follow from hence, That the Fluxion of a Quantity, that expresses a Maximum, or a Minimum, must be equal to Nothing or to Infinite. And upon this Foundation we may now easily proceed to the Speculation of the Points of Inflection and Retrogression.

In order to find a General Theorem to assist us in this Matter, let us consider the Curve *AFK*, whose Diameter is the Right-Line *AB*; and its Ordinates *PM*, *ef*, parallel to one another. If thro' the Point *F* be drawn the Ordinate Applicate *EF*, together with the Tangent *FL*; and from any other Point as *M*, on the same side with *AF*, he draws the Ordinate Applicate *MP*, as likewise the Tangent *MT*: It is evident,



1. In these Curves that have a Point of Inflection, that the Abscissa *AP* encreaseth continually, and

that the Part *AT* of the Diameter, intercepted between *A* the Original of *X*, and *T* the Concourse of the Tangent and the Axe, encreaseth such time as the Point *P* fall upon *E*, and after it again begins to diminish: From whence it is apparent, that *AT* must become the Maximum *AL*, when the point *P* falls upon the point *E* required.

2. In those Curves that have a Point of Retrogression, 'tis evident, that the part *AT* encreaseth continually, and that the Abscissa encreaseth so long, till the point *T* fall upon *L*, after which it again diminisheth: From whence it is clear, That *AP* must become a Maximum, when the point *T* falls upon *L*.

Now if *AE* be put $= x$, *EF* $= y$, then, will *AL* be $= \frac{y}{x} - x$, whose Fluxion, which is

$\frac{y^2}{x^2} \frac{x - y}{x} - \frac{y}{x}$ (supposing *x* invariable) being di-

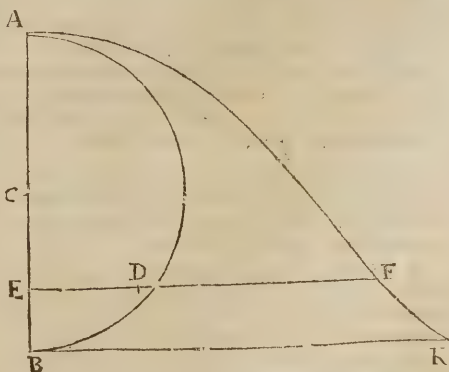
vided by *x*; the Fluxion of *AE* must become Nothing or Infinite; that is $-\frac{y}{x^2} = \text{Nothing or}$

Infinite: So that the multiplying by y^2 , and divi-

ding by $-y$, y will be $=$ to Nothing or Infinite; which in the Sequel will serve for a general Form to find *F* the Point of Inflection or Retrogression. For the Nature of the Curve *AFK* being given,

the Value of *y* may be found in *x*; and taking the Fluxion of this Value, and supposing *x* invariable, the Value of y^2 will be found in x^2 , which being put equal to Nothing, or Infinity, serves in either of these Suppositions to find such a Value of *AE*, as that the Ordinate *EF* shall intersect the Curve *AFK* in *F* the point of Inflection or Retrogression. Of this I shall only now, from the *Analyse des Infiniment Petits*, give one

EXAMPLE.



Let *AFK*, be a protracted Semi-cycloid, whose Base is longer than the Circumference of the generating Circle *ADB*, whose Center is *C*. 'Tis required to find *E* in the Diameter *AB*, so that the Ordinate Applicate *EF* shall cut the Semi-cycloid in *F*, the Point of contrary Flexion.

Sup-

Suppose the known Quantities $ADB = a$; $BK = b$; $AB = 2c$, and the unknown Quantities $AE = x$, $ED = z$, the Ark $AD = u$, $EF = y$; then by the Property of the Cycloid $y = z + \frac{bu}{a}$;

and therefore $y = z + \frac{bu}{a}$: But by the Property of the Circle $z = \sqrt{2cx - xx}$, and consequently

$$z = \frac{cx - xx}{\sqrt{2cx - xx}}, \text{ and } u(\sqrt{x^2 + z^2})$$

$$= \frac{cx}{\sqrt{2cx - xx}}. \text{ Therefore substituting for } z \text{ and } u \text{ their respective Values, we have } y$$

$$= \frac{acx - axx + bcc}{a\sqrt{acx - xx}}, \text{ and the Fluxion thereof, (supposing } x \text{ invariable) is,}$$

$$\frac{bcx - acx - bcc}{2cx - xx} \times \frac{cx}{\sqrt{2cx - xx}} = 0; \text{ that is,}$$

$$AE(x) = c + \frac{ac}{b}, \text{ and } CE = \frac{ac}{b}.$$

Hence it is evident, That to have F , a Point of contrary Fluxion, b must be greater than a ; for if it be less, then CE would exceed CB .

INFLUENCES of the Planets, or Heavenly Bodies, are such Physical Powers or Forces, as they are supposed to have on Sublunary Things.

Mr. Boyle is inclined to believe (tho' he had no Opinion of Judicial Astrology in other respects) that the Planets may have some Physical Influence or Operation on Bodies belonging to our Globe, from these Considerations.

1. That it cannot be denied, that all the Affections and Dispositions of Moisture, Heat, Cold, Drought, the Course of all Winds, Showers, Thunder, &c. and whatever else helps to produce the great and universal Effects of Rarefaction and Condensation in our Atmosphere, do in a great Measure, if not entirely, depend on the Motion, Position, Situation, and Aspects of the Superior Celestial Bodies or Planets. That every Planet hath its own proper Light distinct from every other, which Light not being a bare Quality, but designed for a further use than meer Illumination, must be accompanied with some peculiar Tincture, Virtue, or Power.

2. That this Light of each particular Celestial Body, not being at all Refracted in the Ætherial Spaces, it is transmitted thro', descends entirely and unchanged into our Atmosphere.

3. That whatever is received into our Atmosphere, is also received by the Thin and Subtile Air, which is contiguous to the Atmosphere; which cannot but be capable of being moved, stirred, altered, and influenced by these differently disposed Lights which penetrate each part of it.

4. And since the Thin and Subtile Air is capable of being thus affected, moved and altered by these Planetary Virtues, it must needs variously impress, move, agitate and infect the Spirits or Subtiler parts of all Bodies within its reach; and consequently must have a considerable influence upon the Bodies wherein such Spirits reside, and whom they actuate.

5. This is also farther confirmed, as true in Fact, by those sudden strokes of Cramps, Convulsions, Bites, Colds, Pestilential Invasions, &c. which do not only often, as it were in an Instant, seize on our Bodies, but which do also continue for a long time, &c.

IN FORMA PAUPERIS, in Law, is when any Man that hath a just Cause of Suit, either in the Chancery, or any other of the Courts of Common Law, will come either before the Lord Keeper, Master of the Rolls, either of the Chief Justices, or Chief Baron, and make Oath that he is not worth five Pounds, his Debts paid, either of the said Judges will in his own proper Court, admit him to sue in *forma Pauperis*, and he shall have Council, Clerk or Attorney assigned to do his Business, without paying any Fees.

INFORMATUS NON SUM, or rather *non sum Informatus*, in Law, is a formal Answer made of Course by an Attorney, that is commanded by the Court to say what he thinketh good in defence of his Client; who being not instructed to say any thing material, says, He is *not informed*, by which he is deemed to leave his Client undefended, and so Judgment passeth for the Adverse Party.

INFORMED STARS, are such of the *Fixed Stars*, as are not cast into, or ranged under any Form: see *Sporades*.

INFRASPINATUS, or *supra Scapularis inferior*, is a Muscle of the Arm, so called, because it is placed below the Spine. This arises fleshly from the inferior part of the *Basis Scapula*, as also from its Spine, and Inferior *Costa* and *Dorsum*; from hence passing in a Triangular Form, according to the Figure of the Part, lessening it self as it marches over the Juncture it becomes Tendinous, and is inserted like the *Supra Spinatus* to the Head of the *Os Humeri*. This moves the Arm directly backward.

INFUNDIBULUM CEREBRI, the same that *Choana*.

INFUNDIBULUM RENUM, is the Pelvis or Basin thro' which the Urine passes to the Ureters and the Bladder.

INFUSION, is an Extraction of the Vertue of Medicines with a convenient Liqueur, which if it be Purgative, it is usually taken at one Dose; and to this the Name properly agrees.

INGREDIENTS, are the several Parts or Simples that go to the making of any Compound Medicine; and in general it signifies the Constituent Parts or Principles of a mixt Body.

INGRESS, in Astronomy, signifies the Sun's entering the first Scruple of one of the four *Cardinal Signs*, especially *Aries*.

INGRESSU, is a Writ of Entry, whereby a Man seeketh Entry into Lands and Tenements: It lies in many Cases, and hath many several Forms: see *Entry*.

This Writ is also called in particular, *Præcipe quod reddat*, because those be formal Words in Writs of Entry.

The Writs, as they lie down in divers Cases, are these, set down in the *Old Nat. Brev. vix*.

INGRESSU ad communem Legem, is a Writ which lieth where a Tenant for Term of Life, or of another Life, Tenant by Courtesie, or Tenant in Dower, maketh a Feoffment in Fee, and dieth: He in Reversion shall have the aforesaid Writ against whomsoever that is in the Land after such Feoffment made.

INGRESSU ad Terminum qui præterit, a Writ which lieth where the Lands or Tenements are let to

to a Man for Term of Years, and the Tenant holdeth over his Term.

INGRESSU *Causa Matrimonii prelocuti* : see *Causa Matrimonii prelocuti*.

INGRESSU *cui ante divortium* : see *Cui ante divortium*.

INGRESSU *dum fuit infra etatem*, is a Writ which lies where one under Age sells his Lands, &c.

INGRESSU *dum non fuit compos mentis*, is a Writ which lies when a Man selleth Lands or Tenements, being out of his Wits, &c.

INGRESSU *in Casu consimili* : see *Casu consimili*.

INGRESSU *in Casu proviso* : see *Casu proviso*.

INGRESSU *in le per*, is a Writ which lies where one demandeth Lands or Tenements, lett by another after the Term is expired.

INGRESSU *sine assensu capituli*, is a Writ given by the Common Law, to the Successor of him that alienated, *sine assensu capituli*, &c. and so called from those Words contained in the Writ.

INGRESSU *super disseisina in se quibus*, is a Writ which lies where a Man is disseised, and dieth, for his Heir against the Disseisor.

INGRESSU *sur cui in vita*, is a Writ that lies where one demandeth Lands or Tenements of that Tenant that had Entry by one, to whom some Ancestor of the Plaintiff did lett it for a Term now expired.

INGROSSATOR *magni Rotuli* : see *Clerk of the Pipe*.

INGROSSER, in Common Law, is one that buys Corn growing, or dead Victuals, to sell again.

Also a Clerk that writes Records or Instruments of Law in Skins of Parchment.

INGROSSING of a *Fine*, is making the Indentures by the *Chirographer*, and the Delivery of them to the Party unto whom the Cognizance is made.

INGUEN, is that Place from the Bending of the Thigh to the Secret Parts.

INHARMONICAL Relation, a Term in Musick : see *Relation Inharmonical*.

INHERITANCE, is a Perpetuity in Lands or Tenements to a Man and his Heirs : For *Littleton lib. 1. cap. 1.* says, This Word *Inheritance* is not only understood where a Man hath *Inheritance* of Lands and Tenements by Descent of Heritage, but also every Fee-simple or Fee-tail that a Man hath by his Purchase, may be laid by *Inheritance*, for that his Heirs may inherit after him.

INHIBITION, is a Writ to *inhibit* or forbid a Judge from farther proceeding in the Cause depending before him : see *F. N. B. Fol. 39.* where *Prohibition* and *Inhibition* are put together. But *Inhibition* is most commonly a Writ issuing out of a higher Court-Christian to a lower and inferior ; and *Prohibition* out of the King's Court to a Court-Christian, or to an inferior Temporal Court.

INJECTION, is the casting (by a Syringe, &c.) some liquid Medicine into Wounds or Cavities of the Body, or of the Vessels ; Clysters are hence by some called *Injections*.

Several Experiments have been made about

INJECTION of *Liquors*, into the Veins of Animals, from whence probably some good Hints may be taken ; I shall therefore mention some of them.

Sir *Fraxastati*, Professor of Anatomy at *Pisa* in *Italy*, injected a little *Aqua Fortis* diluted into the Crural and Jugular Vein of a Dog, and he died presently ; and had (on opening him) all his Blood

found fixed, except about the Guts : some of the great Vessels were burst.

Some Spirit of *Vitriol* being injected into the Veins of another Dog, he died not so soon, but fetched his Breath thick and difficultly, and foamed like an Epileptick ; but dying at last, he opened him, and found his Blood fix'd in his Veins Grumous and like Soot.

Oil of *Tartar* injected, did not kill the Dog, tho' tried upon him several times ; but he grew more eager for Meat than before, and getting some Bones, he gnawed them most greedily.

Oil of *Sulphur* injected, swelled the Dog and killed him ; his Blood was found not coagulated, but more thin and florid than ordinary ; which Constitution, perhaps, may be as fatal in the Blood, as its being curdled and fixed.

INJUNCTION, is a Writ grounded upon an Interlocutory Order in Chancery ; sometimes to give Possession to the Plaintiff, for want of the Defendant's Appearance ; sometimes to the King's Ordinary Court, and sometimes to the Court-Christian, to stay Proceedings in a Cause upon Suggestion made, That the Rigour of the Law, if it take place, is against Equity and Conscience in that Case.

INIUM, is the Beginning of the oblongated Marrow, which is the common Sensory, because the Species which are received from the external Organs are conveyed thither by the Nerves. *Blanchard*.

INLAGARY, a Term in Law, signifying a Resstitution of one Ourlaw'd to the King's Protection, and to the Benefit or Estate of a Subject.

INNATE Principles, according to some Philosophers, are primary Notions or Characters which they will have to be stamp'd upon the Mind of Man when it first receives its Being, and which it brings into the World with it.

INNOMINATA *Tunica Oculi*, the Tunick of the Eye that wants a Name, is a certain subtile Expansion of the Tendons, from the Muscles which move the Eye to the Circumference of the *Iris* or Horney Membrane.

INNOMINATA *Ossa*, are two large Bones situated on the sides of the *Os Sacrum*, and in a *Femur* may each be separated into three Bones, *Ilium*, *Os Pubis*, and *Ischium*, joined by Cartilages, and appear distinct by three Lines 'till seven Years old, but grow all into one Bone at riper Years : they are by some called *Cuneiformia*.

INNOMINATUS *Humor*, or *Infitus*, is a Secondary Humour, as the Ancients call it, wherewith they thought the Body was nourished : For those Nutritious Humours they talked of are four, *Innominatus*, *Ros*, *Gluten*, *Cambium*. *Blanchard*.

INNOTESCIMUS, in Law, are Letters Patents which are always of a Charter of Feoffment, or some other Instrument not of Record, and so styled in the Words of the Conclusion, *Innotescimus per presentes*.

INNS-OF-COURT, are so called, because the Students there study the Laws, to enable them to practise in the Courts of *Westminster*, or elsewhere. These are the *Middle* and *Inner Temple*, *Lincoln's Inn*, and *Gray's Inn*. There are also two Serjeants-Inns, and eight Inns of Chancery.

INNUENDO, is a Word frequently used in Writs, Declarations and Pleadings ; and its Use is only to declare and ascertain the Person or Thing which was named or left doubtful before.

INOCULATION, is a kind of Grafting by the Insertion of the Bud of one kind of Fruit-Tree

into the Bark of another, so as to make different Kinds of Fruit grow on the same Tree; and the same common Sap supply them all.

INOSCULATION: see *Anastomosis*.

INQUIRENDO, is an Authority given to a Person or Persons, to enquire into something for the King's Advantage.

INQUISITION, in Law, is a manner of proceeding in Matters Criminal, by the Office of the Judge, or by the great *Inquest* before Justices in Eyre.

INQUISITORS, are Sheriffs, Coroners, *super visum corporis*, or the like, who have Power to enquire into certain Cases.

INROLMENT, in Law, is the Registering, Recording, or Entering of any Lawful Act in the Rolls of the Chancery, as a Recognisance acknowledged, or a Statute, or a Fine levied; or in the Rolls of the Exchequer, King's-Bench, or Common Pleas; or in the Hustings of London, or by the Clerk of the Peace in any County.

INSANIA, or *Amentia*, Madnets, is an Abolition or Deprivation of Imagination and Judgment.

INSCONCED, a Term in the Art Military, implying that a Part of an Army hath fortified themselves with a Sconce or small Fort, in order to defend some Pass, &c. See *Sconces*.

INSCRIBED, in Geometry, a Figure is said to be *inscribed* in another, when all the Angles of the Figure *inscribed* touch either the Angles, Sides, or Planes of the other Figure.

INSCRIBED Bodies: see *Regular Bodies*.

INSESSUS, is a Bath for the Belly, proper for the Lower Parts, wherein the Patient sits down to the Navel. They are for several Uses, as for easing of Pain, softning of Parts, dispelling of flatulent Matter, and frequently for exciting the Courses.

Blanchard.

INSIMUL Tenuit, is one of the Species of the Writ called *Formedon*; which see.

INSISTING, the Angles in any Segment, in Geometry, are said to be *insisting* upon the Arch of the other Segment below.

INSITIO, the Botanick Word for *Grafting*; it signifies in general, the Insertion and Uniting of any Cyon, Bud, &c. into the Substance of the Stock, and is of divers Kinds.

INSOLATION, is exposing of any Body to be warmed or heated by the Beams of the Sun.

INSEXIMUS, are Letters Patent, so called because they begin, after the King's Title, with this Word *Inseximus*; and is the same with *Exemplification*.

INSPIRATIO, is an alternate Dilatation of the Chest, whereby the Nitrous Air is communicated to the Blood, to accend it by the Wind-pipe and its *Vesicular Parts*.

The Cause of *Inspiration* doth not seem to consist only in the Dilatation of the Thorax, as is commonly thought, but also in the Contraction of the *Tunick*, which covers the upper part of the *Oesophagus*, and the most close Recesses of the *Aspera Arteria*. *Blanchard*.

INSTANT, is such a Part of Duration wherein we perceive no Succession; or is that which takes up the Time of only one *Idea* in our Minds, without the Succession of another, wherein we perceive no Succession at all.

INSTITUTIONS, or *Institutes*, Part of the First of the Four Tomes or Volumes of the Civil Law, and is a Compendium of the Digest drawn into Four Books, composed on purpose by the Emperor for the Use of young Students, that so having

the first Elements of the whole Profession in this little Treatise, they might the sooner gain a competent Knowledge of it, without being discouraged by the Largeness of the former Books.

INTACTÆ, are Right Lines, to which Curves do continually approach, and yet can never meet with them: These are usually called *Asymptotes*; which see.

INTEGERS, from the Latin *Integrum*, signifies in Arithmetick whole Numbers, in Contradiction to Fractions.

INTENSION, is a Writ that lies against him that enters after the Death of a Tenant in Dower, or other Tenant for Life, and holds him out in the Reversion or Remainder: And every Entry upon the Possession of the King, is called an *Intension*; as where the Heir of the King's Tenant enters after Office, and before Livery, this is called an *Intension upon the King*.

Intension, in Natural Philosophy, signifies the Increase of the Power or Energy of any Quality, such as Heat, Cold, &c. for of all Qualities, they say, they are *Intended* and *Remitted*; that is, capable of Increase and Diminution. Under the Word *Quality* you will find it demonstrated, That the *Intension* of all Qualities increases reciprocally, as the Squares of the Distances from the Center of the Radiating Quality decreases.

INTENTION, or *Study*, is when the Mind with great Earnestness, and of Choice, fixes its View on any *Idea*, considers it on all sides, and will not be called off by the ordinary Solicitation of other *Ideas*.

INTERCALARY-DAY, is the odd Day put in or inserted in the *Leap-Year*.

INTERCEPTED-AXE, a Term in Conick Sections, signifying the same with *Abscissa*; which see.

INTERCOLUMNIATION, is the Space or Distance between the Pillars of any Building.

INTERCOLUMNS, or *Intercolumniation*, in Architecture, are the Spaces between Column and Column in any Portico or great Piazza, &c.

INTERCOSTAL-ARTERIES, are Arteries, according to some, so called, because they go to the Regions about the Ribs: The upper bestows it self among the Muscles that are between the four highest Ribs; and the under one goes to every Muscle that is between the rest of the Ribs.

INTERCOSTAL-VESSELS, are the Veins and Arteries that run along the Intervals or Spaces of the lower and upper Ribs; on which account they are distinguished into Superior and Inferior.

INTERCOSTALES *Externi* & *Interni*, are Muscles placed in the Intervals of the Ribs, as their Names declare. Their Number on each side is twice eleven, equal to the Interstices in which they are lodged. Their Originations are differently assigned by Anatomists; but 'tis most probable that they do arise from the lower Edge of each superior Rib, and are inserted to the upper Edge of each inferior one. These are thin and fleshy; the Fibres of the External pass from above obliquely downwards to the Fore-part, or *Ossa Pubis*: Those of the Internal descend in like manner obliquely towards the Back-part, or *Ossa Sacrum*, their Fibres decussating each other like the Letter X.

INTERCUS; see *Anasarca*.

INTEREST, is the Sum reckoned for the Loan or Forbearance of some principal Sum lent for (or due at) a certain Time, according to some certain Rate, and therefore called *Principal*, because it is the Sum that procreates the *Interest*, or from which their

the *Interest* is reckoned; and is either *Simple* or *Compound*.

I. *Simple Interest*, is counted from the *Principal* only, and is easily computed by the *Simple* or *Compound Golden Rule*, thus:

Let that which is the principal Cause of the *Interest* be put into the first place; and that which becometh Time, be in the second place; and the remaining in the third: Under this Conditional part place the two other Terms, each under its like, and there will be a Blank to supply under one of those above, either under the first, second, or third:

E X A M P L E

If 100 l. in 12 Months gain 6 l. (this is the Conditional part;) What shall 50 l. get in 3 Months?

Place them down as in the Rule:

l.	m.	l.
100.	12	6
50	3	

Here the Blank will be under the third place, and by this

R U L E I.

Multiply the three last for a Dividend, and the two first for a Divisor, the Quotient of these gives the sixth.

That is, $6 \times 50 \times 3 = 900$, and $100 \times 12 = 1200$.
Now $1200 \div 900 = .75 = 15 \text{ s. required}$.

But if the Demand had been, In how many Months would 50 l. have gained 15 s. Or if 100 l. in 12 Months gain 6 l. What shall the Principal be, that in 3 Months would gain 15 s. In these two Cases the Blank would have been under the first or second Terms: Then by this

R U L E II.

Multiply the first, second, and last for a Dividend, and the third and fourth for a Divisor; the Quotient is the Answer.

l.	m.	l.
103	12	6
	3	.75 = 15 s.

Then by the Rule, $100 \times 12 \times .75 = 900.00$.
And $6 \times 3 = 18$ 900. (50 l. required.

This Rule shews *Simple Interest* and all that belongs to it with ease, and was thus found;

Put P for the Principal, T for the Time, and G for the Gain in the Conditions; and p, t, g answering, it will be, $P : G :: t : p$. $\frac{G p}{P}$.

And $T : G p :: t : \frac{G p t}{T P} = g$, which is the first Rule, that is, multiply the three last for a Dividend, and the two first for a Divisor.

And because $\frac{G p t}{T P} = g$, therefore $G p t =$

$T P g$; and consequently $t = \frac{T P g}{G p}$, and $p = \frac{T P g}{G t}$, which is the second Rule,

II. *Interest Compound*, is that which is counted from the *Principal*; and *Simple Interest* forborn, called also *Interest upon Interest*.

And for the resolving of Propositions relating to *Compound Interest*, first state the Question propos'd, as tho' the Demand lay upon one Pound only; and having found a fit Answer (according to the Import of the Question) for one Pound, to a convenient Number of Decimal parts, multiply the Sum or Number of Pounds, &c. propos'd in the Question, into that Answer agreeing to one Pound, the Product arising from thence will be the Answer required.

Mr. Ward hath done this very well at the End of his Algebra, thus:

For the easier expressing of the several parts given or sought, they may be represented by the following Letters;

Let $P =$ the Principal, $\left\{ \begin{array}{l} \text{given or sought in any Question.} \\ \text{For Number of Years or Days,} \\ \text{\&c. given or sought.} \end{array} \right.$
 $t =$ the Time,
 $a =$ the Amount, $\left\{ \begin{array}{l} \text{of one Pound, for one Year,} \\ \text{or Day, \&c. according to any} \\ \text{Rate proposed.} \end{array} \right.$
 $\Sigma =$ the Sum, $\left\{ \begin{array}{l} \text{for amount of Principal and} \\ \text{Interest given or sought.} \end{array} \right.$

Note, That in the Cases of *Compound Interest*, (t) is the Index of the Power of (a).

Now, by considering the two following Propositions, a General Theorem may be raised, by which all Questions in *Compound Interest* may be resolved.

First, $1 l. : a :: g : a a :: a a : a^2 :: a^2 : a^3 :: a^3 : a^4 :: a^4 : a^5 \text{ \&c. in } \dots$

That is, As one Pound: Is to its Amount (or one Pound with its Interest) at one Years End: So is that Amount: To the Amount of one Pound at two Years; and so on.

Whence 'tis plain, That *Compound Interest* is grounded upon a Rank of Geometrical Proportionals continued, the last of which is known by the Number signified by (t) and is a^t .

Secondly, $1 l. : a^t :: P : \Sigma$; Ergo $P a^t = \Sigma$.

That is, As one Pound: Is to the Amount of one Pound for any Time propos'd: So is 10, 100, 1000, or any Sum propos'd: To its Amount for the same Time.

From these two Proportions the General Theorem $P a^t = \Sigma$ is sufficiently demonstrated, and may be clearly understood.

Quest. 1. Suppose 250 l. hath been at Interest seven Years; What doth it amount to at 6 per Cent. per Annum, Compound Interest?

Here is given $P = 250$ l. $t = 7$, and $a = 1.06$.

For $100 : 6 :: 1 : 1.06 = a$, the first Year.

Then if a be involved so often, until its Index $= t$, viz. $a^7 = a^7$, and then multiplied into P , it will produce \tilde{z} , as appears by the Theorem $P a^t = \tilde{z}$.

But $a = 1.06$, involved 7 times $= 1.50363$.

And $250 \times 1.50363 = 375.9075 = \tilde{z}$.

That is, 375 l. 18 s. 2 d. is the Sum produced from 250 l. having been at Compound Interest seven Years (as above proposed.)

Quest. 2. Suppose 375 l. 18 s. 2 d. were to be paid seven Years hence; What is it worth in ready Money, abating 6 per Cent. per Annum, Compound Interest?

Here is given $\tilde{z} = 375.9075$, $t = 7$, and $a = 1.06$; to find P .

General Theorem is $P a^t = \tilde{z}$, therefore $\frac{\tilde{z}}{a^t} = P$.

But $a = 1.06$, and involved 7 times $= 1.50363$.

And $\frac{375.9075}{1.50363} (= 250 = P)$; that is, worth 250 l. ready Money.

Quest. 3. Suppose 250 l. hath been at Interest, and the Amount is 375 l. 18 s. 2 d. at 6 per Cent. Compound Interest; How long hath it been forborn?

Here is given $P = 250$, $\tilde{z} = 375.9075$, and $a = 1.06$, for one Year; thence to find t , the Index of the Power of a .

General Theorem, $P a^t = \tilde{z}$; ergo, $\frac{\tilde{z}}{P} = a^t$.

Consequently, if a^t be continually divided by a , until it become $\frac{a}{a} = 1$, the Number of such Divisions will be t : For such Number of Divisions discovers how oft a was involved.

But $\frac{375.9075}{250} (= 1.50363 = a^t)$

And $\frac{1.50363}{1.06} (= 1.418518)$

Also $\frac{1.418518}{1.06} (= 1.338225)$

And so on till it become $\frac{1.06}{1.06} (= 1$, which will be at the seventh Operation.

Then will $t = 7$, the Number of Years required.

Quest. 4. Suppose 250 l. had been forborn seven Years, and the Debtor is willing to give up both Principal and Interest, proffering 375 l. 18 s. 2 d. to be cleared; What Rate of Interest, per Cent. (allowing Compound Interest) doth he hereby offer to the Creditor?

Here you have given $P = 250$, $\tilde{z} = 375.9075$, and $t = 7$, to find a .

General Theorem, $P a^t = \tilde{z}$, ergo $\frac{\tilde{z}}{P} = a^t$.

That is, $a^7 = a^7$, consequently $\sqrt[7]{\frac{\tilde{z}}{P}} = a$.

But $\frac{\tilde{z}}{P} (= 1.50363 = G)$.

Let $a = r + e$.

Then $r^7 + 7 r^6 e + 21 r^5 e^2 + 35 r^4 e^3 + 35 r^3 e^4 + 21 r^2 e^5 + 7 r e^6 + e^7 = G = 1.50363$.

$\frac{1}{7} r^7 + r^6 e + 3 r^5 e^2 = \frac{1}{7} G$.

$\frac{1}{7} r r + r e + 3 e e = \frac{1}{7} G$.

$r e + 3 e e = \frac{1}{7} G - \frac{1}{7} r r = D$.

Hence this Theorem, $\frac{D}{r + 3 e} = e$.

Let $r = 1$ $1.50363 = G$.
 $.214804 = \frac{1}{7} G - \frac{1}{7} r^2$.
 $-.142857 = \frac{1}{7} r r$.

$r = 1$ $.071947 = D$ ($.06 = e$).
 $+ 3 e = .18$ $.708$

Divid. $= 1.18$ $.21480428 = \frac{1}{7} G$.
 $.16051432 = \frac{1}{7} G - \frac{1}{7} r^2$.

First $r = 1$ $.16051428$
 $+ e = .06$ $.00000004$

New $r = 1.06 = a$

Then $1 : 1.06 :: 100 : 6 =$ the Rate of the Interest required.

But if in any Questions, either of Interest or Annuities, the Time given or sought be not terminated by whole Years, but by Weeks, Months, Quarters, Half-Years, Three Quarters, &c. for resolving such Questions, first reduce such broken or Fractional parts of the Year into Days, viz. $\frac{1}{4} = 91.25$ Days, $\frac{1}{2} = 182.5$ Days, $\frac{3}{4} = 273.75$ Days; and so for any odd Number of Days that falls betwixt such even parts of the Year.

This done, find an Answer according to the Demand of the Question, (and agreeing to one Pound as before) for the Number of the Days proposed.

To perform which, it will be requisite to resolve this following Question.

Quest. 5. What is the Amount (or Interest) of one Pound for one Day, at 6 per Cent. per Annum, Compound Interest?

Put a for the Amount sought, then 'twill be,

$1 : a :: a : a^2 :: a^2 : a^3 :: a^3 : a^4 :: a^4 : a^5 :: a^5 : a^6$, &c. \div .

That is, As one Pound : Is to its Amount for one Day :: So is that Amount : To the Amount for two Days :: And so is that of two Days : To that of three Days; and so on to 365 Days.

The

The last of which will be $a^{365} = 1.06$.
 Let $a = r + e$.
 Then $r^{365} + 365 r^{364} e + 66430 r^{363} e^2 = 1.06 = G$.
 $\frac{1}{365} r^{365} + r^{364} e + 182 r^{363} e^2 = \frac{1}{365} G$.
 $\frac{1}{365} r r + r e + 182 e e = \frac{1}{365} G$.
 $r e + 182 e e = \frac{1}{365} G - \frac{1}{365} r r = D$.

Whence this Theorem, $\frac{D}{r + 182 e} = e$.
 Let $r = 1$. $.00290410 = \frac{1}{365} G$.
 $+ 182 e = .0182 - .00273972 = \frac{1}{365} r r$.
 Divisor = 1.0182 . $.00016438 = D(.00016 = e$
 10182
 New $r = 1.0001$ 625600
 $+ 182 e = .01092$ 606612
 Divisor = 1.01102

New $r = 1.00016$, for a second Operation.
 Then is, $.00274025636372 = \frac{1}{365} G$.
 $-.00274060280986 = \frac{1}{365} r r$.

Here the Excess lieth upon $\frac{1}{365} r r$, and therefore the Difference or new Resolvend will have the Sign -, and consequently must be -e.

Then—.00000634644614=D(.0000003=e
 $r=1.00016$ 30003162
 $+ 182 e = 1.0000546$ 46414520 (-464=
 Divisor 1.0001054 40004216
 Last $r = 1.00016$ 6413004
 $- e = .0000003464$ 6000530
 $a = 1.0001596536$ 409674
 400040

This Value of a , is the Amount of 1 l. for one Day ; from which, if 1 l. be subtracted, the Remainder will be the Interest of 1 a for one Day ; i. e. .0001596536 : Consequently, if any proposed Sum be multiplied into either of these, the respective Product will be the Amount or Interest of that Sum for one Day.

Hence, if a Table of the several Powers of a was calculated, it would be,

$a : a^2 : a^3 : a^4 : a^5 : a^6 : a^7 =$ the Amounts.
 1, 2, 3, 4, 5, 6, 7, = the Days.
 And so on to $a^{365} = 1.06$, the Amount for 365 Days.

Such a Table would be very useful for the speedy resolving of all Questions relating to Compound Interest, &c. for any Number of Days less than one Year.

III. Annuities, Pensions, Leases in Reversion, &c. differ from Compound Interest in this ; that Compound Interest is grounded upon a Rank of Geome-

trical Proportionals continually increasing ; but Annuities, &c. upon a Rank of Geometrical Proportionals continually decreasing ; and may be thus represented,

Let $p =$ the $\left\{ \begin{array}{l} \text{Pension or Annuity ; and is the first} \\ \text{or greatest Term in the Progression.} \end{array} \right.$
 $t =$ the $\left\{ \begin{array}{l} \text{Time of Continuance (as in Interest)} \\ \text{and is the Number of all the} \\ \text{Terms except the first.} \end{array} \right.$
 $a =$ the $\left\{ \begin{array}{l} \text{Rate of Interest for one Pound (as} \\ \text{before) and is the Common} \\ \text{Ratio of all the Terms.} \end{array} \right.$
 $\Sigma =$ the $\left\{ \begin{array}{l} \text{Sum of all the Terms, except the} \\ \text{first, and is the Price, or present} \\ \text{Worth of any Annuity or Pension,} \\ \text{\&c.} \end{array} \right.$

Hence the Progression will be,

$$p : \frac{p}{a} :: \frac{p}{a} : \frac{p}{a^2} :: \frac{p}{a^2} : \frac{p}{a^3} :: \frac{p}{a^3} : \frac{p}{a^4} :: \frac{p}{a^4} : \frac{p}{a^5} :: \frac{p}{a^5} : \frac{p}{a^6} :: \frac{p}{a^6} : \frac{p}{a^7} :: \frac{p}{a^7} : \frac{p}{a^8} :: \frac{p}{a^8} : \frac{p}{a^9} :: \frac{p}{a^9} : \frac{p}{a^{10}} :: \frac{p}{a^{10}} : \frac{p}{a^{11}} :: \frac{p}{a^{11}} : \frac{p}{a^{12}} :: \frac{p}{a^{12}} : \frac{p}{a^{13}} :: \frac{p}{a^{13}} : \frac{p}{a^{14}} :: \frac{p}{a^{14}} : \frac{p}{a^{15}} :: \frac{p}{a^{15}} : \frac{p}{a^{16}} :: \frac{p}{a^{16}} : \frac{p}{a^{17}} :: \frac{p}{a^{17}} : \frac{p}{a^{18}} :: \frac{p}{a^{18}} : \frac{p}{a^{19}} :: \frac{p}{a^{19}} : \frac{p}{a^{20}} :: \frac{p}{a^{20}} : \frac{p}{a^{21}} :: \frac{p}{a^{21}} : \frac{p}{a^{22}} :: \frac{p}{a^{22}} : \frac{p}{a^{23}} :: \frac{p}{a^{23}} : \frac{p}{a^{24}} :: \frac{p}{a^{24}} : \frac{p}{a^{25}} :: \frac{p}{a^{25}} : \frac{p}{a^{26}} :: \frac{p}{a^{26}} : \frac{p}{a^{27}} :: \frac{p}{a^{27}} : 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The very Ingenious and Learned Capt. Halley hath, in his Observations on the Breslaw Bills of Mortality, (in *Philos. Trans.* N. 196,) shewed several ways of estimating the Values of Annuities and Lives, and computing the different Degrees of Mortality, or rather, as he calls it, Vitality; where he proves, That 'tis 80 to 1, that a Person of 25 Years old doth not die in a Year: That 'tis 5 and a half to one, a Man of 40 lives 7 Years: That a Man of 30 may reasonably expect to live between 27 and 28 Years, &c. And he gives Rules for the Valuation of 2 or 3 more Lives, and what an Annuity is worth during the Continuance of any of them, &c.

INTERFORAMINEUM, or *Interfemineum*, the same with *Perineum*.

INTERJECTION, in Grammar, is an indeclinable Word used in a Sentence, to declare the Affections or Passions of the Mind, and to compleat the Sense of it.

INTERIOR Polygon: see *Polygon Interior*.

INTERIOR Talus: see *Talus*.

INTERLOCUTORY Order, is that which decides not the Cause, but only settles some intervening Matter relating to the Cause; as where an Order is made by Motion in *Chancery*, for the Plaintiff to have an Injunction, to quit his Possession till the hearing of the Cause; this, or any other such Order not being final, is *Interlocutory*.

INTERMISSIO Febrium: see *Apexia*.

INTERMITTENS Morbus, is a Disease which comes at certain times, and then remits a little.

INTERNAL Angles: see *Angles Internal*.

INTERNODIUM, in Botany, is the Space contained between any two Knots or Joints of the Stalk of a Plant.

INTERNUS Auris, is a Muscle which lies in a Bony Channel evacuated in the *Os Petrosum*, which makes one of the *Parietes Tympani*: One part of this Channel is without the *Tympanum*, and lies in the upper part of the Bony Passage which goes from the Ear to the Palate; the other part, which is within the *Tympanum*, advancing as far as the *Fenestra Ovalis*, makes in that place a rising, upon which, as on a Pulley, the Tendon of this Muscle passes to the other Side of the *Tympanum*, and inserts it self at the posterior part of the Handle of the *Malleus*, a little below the Insertion of the External Muscle, by which means it draws towards the *Os Petrosum*. When this Muscle acts it pulls the *Manubrium* of the *Malleus* towards the *Os Petrosum*, whereby the *Membrana Tympani* becomes somewhat concave outwardly.

INTEROSSEI Manus, are the Muscles of the Fingers, which are distinguished into External and Internal; they are aptly to named from their Situations. Authors disagree in their Number, some reckoning six, others eight, amongst which they esteem the *Abductor Minimi Digiti*, and *Indicis*; but Mr. *Cowper* inclines to the first Opinion, conceiving the two latter named Muscles do not deserve these Denominations. They arise fleshy internally in the Palm from the superior parts of the Metacarpal Bones next the *Carpus*, whence descending, they become Tendinous at the first Internode of each Finger laterally, and pass to their Insertions with the *Extensor Digitorum Communis*; each Interstice of the Metacarpal Bones entertaining two Muscles inserted to the Sides of the Fingers. When all these *Interossei* act together, they draw the Fingers near each other, and assist in their Extension, as *Galen* takes notice; at which time they, together with the *Abductor Indicis*, and *Minimi Digiti*, are capa-

ble of divaticating the Fingers, which Action cannot be performed without some Difficulty by them when they are bended; which Contrivance of the most Wise Architect is also observed by *Galen*.

INTEROSSEI Pedis, are Muscles of the Foot; they are reckoned to be seven in Number. They derive their Names from their Situation, and may each deserve a proper Appellation from their Use.

The First may be called *Abductor Minimi Digiti*.

The Second, which is the largest, draws the next Toe towards the lesser, and may be called, *Abductor Auricularius*.

The Third antagonizes the former, and is an *Abductor of the Toe*.

The Fourth may be called *Abductor Medii Digiti*.

The Fifth is an *Abductor of the same*.

The Sixth is an *Abductor*; and Seventh, *Abductor Indicis Pedis*.

All these arise fleshy from the superior part of the *Ossa Metatarsi* of the lesser Toes, and becoming bellied, grow Tendinous at their Insertions to the first Internode of each lesser Toe laterally.

INTERROGATION, is a Figure in Rhetorick, in which the Passion of the Speaker introduces a thing by way of Question, to make its Truth the more conspicuously appear.

INTERRUPTION, as some call it, is the same with Disjunction of Proportion in Geometry, and is noted thus, ($::$) and signifieth the breaking off of the Ratio in the middle of four disjunct or discrete Proportionals, As $A : B :: C : D$; that is, As A is to $B ::$ So is C to D .

INTERSCAPULARIA, are the Cavities betwixt the Shoulder-blades and the Vertebres.

INTERSECTION, in Mathematicks, signifies the cutting of one Line or Plane by another: Thus we say, that the mutual Intersection of two Planes, is a Right Line.

INTERSPERSUM Vacuum: see *Vacuum*.

INTERSPINALES Colli; these are small fleshy Muscles of the Neck, arising from the superior parts of each double spinal Process of the Neck, except of the second *Vertebra*; and are inserted to the inferior Parts of all the said double Spines. When these Muscles act, they draw the Spines of the *Vertebra* of the Neck nearer each other. These were first discovered in the Year 1690.

INTERSTELLAR, a Word used by some Authors, to express those parts of the Universe that are without and beyond our Solar System; and which are supposed as Planetary Systems moving round each fix'd Star as the Center of their Motion, as the Sun is of ours: And if it be true, as 'tis not improbable, That each fix'd Star may thus be a Sun to some habitable Orbs that may move round it, the *Interstellar* World will be infinitely the greater part of the Universe.

INTERTRIGO, or *Atritus*, is cutting or fretting the *Cuticula* off of the parts near the Fundament, or betwixt the Thighs.

INTERVAL, in Musick, is the Distance or Difference between any two Sounds, whereof one is more Grave, and the other more Acute. They make several Divisions of an *Interval*, as first into *Simple* and *Compound*: The *Simple Intervals* are the *Octave*, and all that are within it, as the *Second*, *Third*, *Fourth*, *Fifth*, *Sixth*, and *Seventh*, with their Varieties: The *Compound* ones are all those that are greater than an *Octave*, as the *Ninth*, *Tenth*, *Eleventh*, &c. with their Varieties.

An *Interval* is also divided into *Just* or *True*, and into *False*: All the above-mention'd *Intervals*, with their

IONICK Order of Architecture, is the Form of a Column or Pillar invented by the *Ionians* in Ancient Greece, by way of Improvement of the Beauty of the *Dorick Order*; which as it was taken from the Figure of a robust Man's Body; and designed to represent Solidity and Strength, so the *Ionians* having more regard to Beauty, chose an Order of a more Elegant Proportion, which occasioned this Order to be called, *The Feminine Order*; and soon after it sprung up that of the *Caryatides*.

The Promotions of this Pillar, as they are taken from the famous one in the Temple of *Fortuna Virilis* at Rome, now the Church of St. Mary the Egyptian, are these;

The intire Order from the Superficies of the *Arca* to the *Cornice*, are 22 Modules or 11 Diameters.

The Column with its Base and Capital, contains 18 Modules.

The *Entablature* (i. e. the *Architrave*, *Frieze*, and *Cornice*) contain 4 Modules.

The *Voluta* of the Capital, is of an Oval Form.

The Columns in this Order are often hollow'd and furrow'd with 24 Gutters; and sometimes 'tis done only to the third part of the Column, reckoning from the Bottom; and then that third part hath its Gutter filled with little Rods or Baroons, all the part of the Hollow above being left empty.

JONTHUS, or *Varus*, is a little hard, callous Swelling in the Skin of the Face. *Blanchard*.

JOURNEYS Accounts, is a Term in Law, to be thus understood: If a Writ be abated without the Default of the Plaintiff or Demandant, he may purchase a new Writ, which if it be purchased by *Journeys Accounts*; (that is, within as little Time as he possibly can after the Abatement of the first Writ) then this second Writ shall be as a Continuance of the first, and so shall ought the Tenant or Defendant of his Voucher, Plea, or Non-tenure, Joint-tenancy fully administered, &c. or any other Plea which arises upon Matter happening after the Date of the first Writ; and 15 Days have been held a convenient Time for the Purchase of the new Writ.

JOY, is a Delight of the Mind, from the Consideration of the present, or assured approaching Possession of a Good; and we are then possessed of any Good, when we have it so in our Power that we can use it when we please.

JOYNTURE, is a Covenant, whereby the Husband, or some other Friend in his Behalf, assureth unto his Wife, in respect of Marriage, Lands or Tenements for a Term of Life: Or otherwise

It is so called, either because granted *Ratione Juncture in Matrimonio*; or because the Land in *Frank-marriage* is given jointly to the Husband and Wife, and after to the Heirs of their Bodies, whereby the Husband and Wife be made Joint-Tenants during the Coverture.

IRIS, is that fibrous Circle next to the Pupil of the Eye, distinguished with Variety of Colours: see *Uvea Membrana*. 'Tis so called from its Similitude to a Rainbow, (in Latin *Iris*.)

Also those changeable Colours which sometimes appear in the Glasses of Telescopes, Microscopes, &c. are called *Iris* for the same Reason; as is that coloured *Spectrum*, which a Triangular Prismatick Glass, will project on a Wall, when placed (at a due Angle) in the Sun-beams: see *Rain-bow*.

IRONY, is a Trope in Rhetorick, by which we speak contrary to our Thoughts; as to say, *Such a one is a very honest Man*, when we know he is notoriously Corrupt.

IRON-SICK, a Ship or a Boat is said to be *Iron-sick*, when her Spikes are so eaten with Rust or

Nails, and so worn away, that they make Hollows in the Planks, whereby the Ship leaks.

IRRADIATION, is a Word used by *Van Helmont*, and some other Chymists, to express the Operation of some Mineral Medicines, which they will have to impart their Virtue, without emitting any thing Material or Substantial out of them, or without the Emanation of any Corporeal Effluvia.

Thus, for Instance, They tell you, That some Antimonial Preparations, as is *Glass* and *Crocus Metallorum*, will give an Emetick Quality to Wine, &c. without any manner of Diminution of its Weight: But it doth not appear that they were well enough exercised in Statical Experiments, either to have nice Scales, or to know how to use them, and therefore, doubtless, do too boldly call that Diminution, which was only not so sensibly so to them: But how a Body should communicate its Vomitive Quality to a Liquor, without impregnating it with some of its fine and subtle Emetick Particles, is hardly possible to conceive.

IRRATIONAL Numbers: see *Surd Numbers*.

IRRATIONAL Quantities: see *Rational Quantities*.

IRREGULAR Bodies, are Solids which are not terminated by equal and like Surfaces.

IRREGULAR Fortification: see *Fortification*.

IRREGULAR Lines or Curves: see *Regular*.

ISAGON, in Geometry, is sometimes used for a Figure consisting of equal Angles.

ISCHÆMA, are Medicines that stop the Blood; which, with a binding, cooling, or drying Virtue, close up the Openings of the Vessels, or diminish and stop the Fluidity or violent Motion of the Blood. *Blanchard*.

ISCHIAS, the Gout in the Hip.

ISCHIAS Major, is a Branch of the *Crural Vein* which goes to the Muscles and Fat of the Leg, and is divided afterwards into several Branches, which are distributed to the Toes.

ISCHIAS Minor, a Branch also of the *Crural Vein*, being but a little one, and is wholly spent on the Muscles and Skin, which are about the upper Joint of the Femur.

ISCHIUM, is the Hip or Huckle-Bone.

ISCHURETICA, are Medicines which force Urine, in the Case of a Suppression of it.

ISCHURIA, is such a Suppression of Urine in the Bladder, that little or nothing of it can be discharged.

ISLES, in Architecture, are Sides or Wings of a Building.

ISOCHROME, Vibrations of a Pendulum, are such as are made in the same space of Time, as all the Vibrations or Springs of the same Pendulum are, whether the Arks it describes be longer or shorter; for when it describes a shorter Ark, it moves so much the slower; and when a long one, proportionably faster.

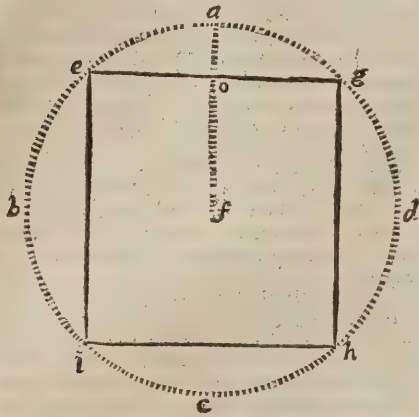
ISOMERIA, in Algebra, is the same with *Conversion of Equations*, (see *Equations*, N. 1.) or of clearing any Equation from Fractions.

ISOPERIMETRICAL Figures, in Geometry, are such as have equal Perimeters or Circumferences.

Of all *Isoperimetric* Figures, the Circle is the greatest.

For if a Right Line could be disposed into the Form of the Circumference of a Circle, it would contain more Space than any other Figure or *Regular Polygon* whatsoever.

As suppose the Circumference of the Circle $abcd$, to be disposed into the Form of a Square, or any other Regular Polygon: so that all the Sides eg , gb , bi , and ic together, may be equal to the



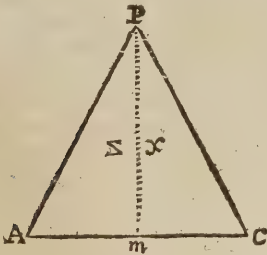
Circumference of the Circle $abcd$; I say the Circle is greater than that Square.

For the Circle is equal to a Rectangle-Triangle, one of whose Legs is the Radius fa , and the other the Circumference. And the Polygon is equal also to such a Triangle, one of whose Legs is the same Circumference $abcd$, or the Sum of the Sides $geib$: And the other Leg is the Line fo , but as fo is less than the Radius fa , so the Triangle, which is equal to the Polygon, must be less than that which is equal to the Circle: Therefore the Square or Polygon must be less than the Circle. W. W. D.

ISOSCELES-TRIANGLE: see Triangle.

PROP. I.

The Angles opposite to the equal Sides of an Isosceles-Triangle are equal; and a Line drawn from the Top (or Vertex) cutting the Base into two equal Parts, is perpendicular to the Base.



Let the Isosceles-Triangle be APC , and let its Base AC be supposed to be divided into two equal Parts in m .

I say Pm is perpendicular to AC ; and the Angle PCA , is equal to the Angle PAC .

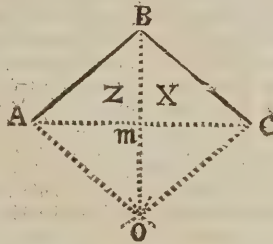
Demonstration.

For the Triangle z hath all its Sides equal to those of x , and therefore must have all its Angles also respectively equal to those in x : And then the Angle $PmA = PmC$, because they are both right;

therefore Pm is perpendicular to AC , and the Angle $PAm = PCm$. Q. E. D.

PROBLEM I.

To Divide a Right Line into Two equal Parts.



Let the Line given be AC , opening the Compass to any Distance more than half the Line AC , and setting one Foot in C , strike an Ark both above and below the middle of the Line; then keeping them at the same Distance, set one Foot in A , and cross the former Arks in O and B ; a Ruler laid from O to B , shall cut the Middle of the AC , or divide it into two equal Parts.

Demonstration.

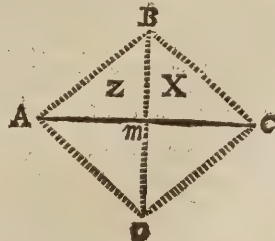
Draw the Lines AB , BC , BO , AO , and CO .
1. Then will the Triangles BAO , and BCO , have all their three Sides respectively equal, and consequently be equal to one another; and therefore the Angle $CBO = \text{Angle } ABO$.

2. The Triangles z and x , have the same two Angles ABm , and CPm equal, and the Side AB equal to the Side BC , and Bm common to both: Therefore all are equal, and consequently $Am = Cm$. Q. E. D.

N. B. By this Problem also, a Perpendicular may be let fall to the middle of any given Line; for here 'tis plain, Bm is perpendicular.

PROBLEM II.

To Divide an Angle given into Two equal Parts.
Let the given Angle be ABC .



Open your Compass to any convenient Distance, and setting one Foot in B , cross the Legs of the Angle in AO , strike an Ark below as at O , and removing the Compass to A , cross the former Ark in the Point O , so a Line drawn from B to O shall Bisect the Angle;

The Demonstration is the same with that of the last Problem.

ISSUANT, a Term in Heraldry, when a Lion, or other Beast, is drawn in a Coat of Arms just issuing out of the Bottom Line of any Chief, Fesse, &c. but if it come out of the Middle of any Ordinary, they call it *Naissant*; that is, *Nascent*, just coming out as it were from the Womb.

ISSUE, a Term in Common Law, having divers Applications; sometimes 'tis taken for the Children begotten between a Man and his Wife; sometimes for Profits growing from Amerciaments or Fines; and sometimes from Profits of Lands or Tenements; sometimes for that Point of Matter depending in Suit, whereupon the Parties join, and put their Cause to the Trial of the Jury: And yet in all these it hath but one Signification, which is an Effect of a Cause proceeding, as the Children be the Effect of the Marriage between the Parents: The Profits growing to the King or Lord, from the Punishment of any Man's Offence, is the Effect of his Transgression: The Point referred to the Trial of Twelve Men, is the Effect of Pleading or Process.

Issue in this last Signification, is either *General* or *Special*.

General Issue, seemeth to be that whereby it is referred to the Jury to bring in their Verdict, whether the Defendant hath done any such thing as the Plaintiff layeth to his Charge.

For Example :

If it be an Offence against any Statute, and the Defendant plead, *Not Guilty*; this being put to the Jury, is called, *The General Issue*.

And if a Man complain of a private Wrong, which the Defendant denieth, and pleads no Wrong nor Disseisin, and if this be referred to the Jury, it is likewise the *General Issue*.

The *Special Issue* then must be that, when Special Matters being alleged by the Defendant in his Defence, both Parties joyn thereupon, and so grow rather to a Demurrer, if it be *Questio Juris*, or to Trial by the Jury, if it be *Questio Facti*.

ISTHMUS, in Geography, is a little Neck or Part of Land joining a *Peninsula* to the *Continent*.

ISTHMUS, in Anatomy, according to some, is that Part which lies betwixt the Mouth and the Gullet, like a Neck of Land; also the Ridge that separates the Nostrials.

ITINERARIUM, is a Chyrurgeon's Instrument, which being fixed in the Urinary Passage, shews the Neck or Sphincter of the Bladder, that an Incision may be more surely made to find out the Stone: 'Tis usually thrust up thro' the Cavity of a Fistulous Catheter, which saves it from wounding the *Urethra* as it goes.

ITHMOIDEA *Offa*: see *Ethmoides*.

JUBA, a Botanick Word, signifying a soft loose Beard, which hangs at the Ends of the Husks of some Plants of the *Fruentaceous Kind*; as particularly in *Millet*.

JUDGE and *Judges*, have all their Commissions bounded with this Limitation, *Facturi quod ad justitiam pertinet secundum legem & consuetudinem Anglie*.

The *Judge*: at his Creation takes this Oath, "That he shall indifferently minister Justice to all them that shall have any Suit or Plea before him; and this he shall not forbear to do, tho' the King by his Letters, or by exprefs Word of Mouth, should command the contrary, &c."

JUDGMENT, in Law, is the Censure of the Judges so called, and is the very Voice and Final Doom of the Law, and therefore is always taken for unquestionable Truth.

Of *Judgments*, some are *Final*, and some *Not Final*: see *Coke* and *Littleton*, Fol. 39.

JUDGMENT, Mr. *Lock* defines to be a Faculty of separating carefully one from another, those *Idea's* wherein any, even the least Difference can be found, thereby to avoid being misled by Similitude and by Affinity, to take one thing for another.

Others define it to be that Action of the Mind, by which assembling together several *Idea's*, we either deny or affirm *This* to be *That*.

Thus, considering the *Idea* of the Earth, and the *Idea* of Roundness, we affirm or deny the *Earth* to be *Round*.

JUGALE *Os*, the same that *Zygoma*.

JUGULAR-VEINS, are those Veins which go towards the Skull by the Neck; and are of two sorts, *viz.* External and Internal.

The *External Jugulars* ascend on the Outside of the Neck, and are usually open'd where one is let Blood in that Part for any Distemper in the Head, *Quinsy*, &c.

The *Internal Jugulars* arise from the *Subclavian*, by the sides of the Wind-pipe, and passing along the Skull in two Branches, are dispersed thro' the *Dura Mater*, &c.

JUGULUM, the same that *Furcula*.

JULAP, from the Greek *Zudama*, or, as some say, from the Persick Word *Zuleb*, which signifies a *sweet Potion*; is a grateful Medicine composed of Distilled Waters, Spirits, &c. and sweetened to the Patient's Palate with Sugar, or some agreeable Syrup.

JULIAN-YEAR, is the *Old Account* of the Year, instituted by *Julius Caesar*, which to this Day we use in *England*, and call it the *Old Style*, in Contradistinction to the *New Account*, framed by *Pope Gregory*, which is Eleven Days before ours, and is called the *New Style*.

JULIAN-PERIOD, is a Cycle of 7980 Consecutive Years, produced by the continual Multiplication of the three Cycles, *viz.* That of the Sun of 28 Years, that of the Moon of 19 Years, and that of the *Indiction* of 15 Years; so that this *Epocha*, although but Artificial or feign'd, (and which was the Invention of the famous *Julius Scaliger*) is yet of very good Use; in that every Year within the Period, is distinguishable by a certain peculiar Character; for the Year of the Sun, Moon, and *Indiction* will not be the same again, till the whole 7980 Years be revolved: *Scaliger* fix'd the Beginning of this Period 764 Years before the Creation.

For the finding the Year of the Julian Period, you have this Rule,

Multiply the Solar Cycle by 4845, the Lunar by 4200, and the *Indiction* by 6916;

Then divide the Sum of Products by 7980, and the Remainder of the Division (without having Regard to the Quotient) shall be the Year enquired after.

Example.

Let the Cycle of the Sun be 3, of the Moon 4, and of the *Indiction* 5;

Multiply

Multiply 8485 by 3, 'twill be 14535; and 4200 by 4 = 16800; and 6916 by 5, gives 35580.

The Sum of the Products is 65915, which divided by 7890, gives 8 in the Quote, and leaves 2075 for a Remainder, which is the Year of the *Julian Period*.

JULUS, is a Botanick Word for those *Catalins*, as some call them, or long Wormlike Tufts, or *Palms*, as they are called in Willows, which at the Beginning of the Year grow out of, and hang pendulous down from Hazels, Walnut-Trees, &c.

The Accurate Mr. Ray thinks them to be a kind of Collection of the *Stamina* of the Flowers of the Tree; because in Fertile Trees and Plants they have abundance of Seminal Vessels or Seed-Pods.

JUPITER: The Proportion of *Jupiter* to our Earth, is about 60 to 1.

The Periodical Time of *Jupiter's* Revolution about the Sun, is in the Space of 12 Years, or 4380 Days; and he revolves round his Axis in the Space of 10 Hours; which very swift Motion may cause that Excess of his Equatorial Diameter above his Polar, which you will find below; whereas in the Sun and Moon, which take, the one 27, the other 28 Days in their Revolution round their Axis, there is no such Inequality between their Polar and Equatorial Diameters observed.

The Mean Distance of *Jupiter* from the Sun, according to *Kepler* 519650; to *Bullialdus* 522520; according to the Periodical Time of its Revolution 520116: Such Parts of which the Mean Distance between the Earth and Sun is 100000; that is, about 280862640 English Miles.

According to Mr. *Cassini*, *Jupiter's* greatest Distance from the Earth is 142919; his mean Distance 115000; and least Distance 87081 Semi-diameters of the Earth.

And the Diameter of *Jupiter* is equal to 27 and a Half Semi-diameters of the Earth.

Wherefore the Globe of *Jupiter* must be greater than that of the Earth by 2460 times.

The Semi-diameter of *Jupiter*, seen from the Sun, is but 19 Seconds, $\frac{1}{2}$.

In the Year 1664, *Campani* by the help of an excellent Telescope observed certain Protuberances and Inequalities in the Surface of this Planet.

He saw also in his Body the Shadows of his *Satellites*, and followed them with his Eye till he saw them go off the Disk.

In the same Year, May the 9th, 2 Hours, P. M. Mr. *Hook*, with a Telescope of 12 Foot, observed a small Spot in the biggest of the three obscurer Belts of *Jupiter*; and within two Hours after he found that the said Spot had moved from East to West about half the Length of the Diameter of *Jupiter*.

Mr. *Cassini* observed also, near the same Time, a permanent Spot in the Disk of *Jupiter*; by whose help he not only found that *Jupiter* turns about upon his own Axis, but also the Time of such Conversion, which he estimates to be 9 Hours, and 56 Minutes.

Which was also confirmed by better Observations of a Spot in the Year 1691.

The Equatorial Diameter of *Jupiter* to his Polar one, Sir *Is. Newton* computes to be as 40 $\frac{1}{2}$ to 39 $\frac{1}{2}$.

Captain *Halley*, in his Preface to his Catalogue of the Southern Stars, saith, That he found *Jupiter* to move swifter than he is supposed to do by the Astronomical Tables.

The same Learned Person thinks, That the Reason of the Error (of about 3 or 4 Minutes in Time) of the Tables in calculating the Eclipses of the Sa-

telles, arises from some small Excentricity in the Motion of the Planet, and from the Oval Figure of his Body newly mentioned, whose quick Rotation round his Axis by the *Vis Centrifuga*, dilates his Equinoctial Parts, and makes his Meridians much Elliptical, so as to be discernable by the Telescope.

The Sun's Heat in *Jupiter*, is at most not above one twenty fifth part of what it is with us; and consequently 'twould be very uncomfortable living there (if at all possible) for Men of our Constitution; and yet some are very fond of thinking *Jupiter* an excellent Place to live in.

The Distance of *Jupiter* from the Sun, is above five times as great as that of the Earth from the Sun, (see *Gregory's Astron.*) and consequently the Diameter of the Sun to any Eye in *Jupiter*, will be not a fifth part of what it appears to us, and therefore his Disk will be above 25 times less, and in the same Proportion will his Light and Heat be.

The Artificial Day and Night (each of 5 Hours) is of the same length in *Jupiter* all over his Surface; because the Axis of his Diurnal Revolution, is nearly at Right Angles to the Plane of his Annual Orbit round the Sun.

Although *Jupiter* hath four Primary Planets below him; yet an Eye placed there, and of no sharper Sight than one of ours, could never behold any one of them, unless as Spots transiting over the Sun's Disk, when they happen to be between the Jovial Eye and the Sun: For *Mars*, which goes furthest of all from the Sun, will not in *Jupiter* be seen above 18 Degrees from him; and since that Planet is but small, and reflects but a weak Light, so near the Sun it cannot be visible: So that *Saturn* is the only Planet that can be seen in *Jupiter*, except his own four Moons or Satellites.

The Sun's Parallax seen from *Jupiter*, will scarce be sensible any more than *Saturn's*; neither being much above 20 Seconds; so that the Sun's apparent Diameter in *Jupiter* will not be above 6 Minutes: But the outermost of his Satellites will appear almost as great as the Moon doth to us; viz. of five times the Diameter, and 25 times the Disk of the Sun, seen from the same Planet; and if the other Satellites are not less than the outermost, they will yet appear much greater, (and the Learned Mr. *Hugens* conceives them not much less than our Earth) and gives the Planet a good Light in the Nights, which also can never there be very long.

Dr. *Gregory*, (from whence this comparative Astronomy is collected) saith also, That an Astronomer placed in *Jupiter*, would easily compare the Distances of the four inferior Planets with the Diameters of *Jupiter*, as we do the Distances of us from the Planets, by comparing them with the Diameter of the Earth: And this would be done as to the four nearest ones, easier than we compute the Distance of the Moon by the Earth's Diameter; for the Horizontal Parallax of the remotest of the Planets seen from *Jupiter*, is above twice as great as the Horizontal Parallax of the Moon seen from the Earth, and therefore must be very sensible and considerable. And tho' the Globe of *Jupiter* be vastly large, in comparison of our Earth; yet the Sun's Parallax, when he's beheld from *Jupiter*, will not be quite 20 Seconds, and consequently scarce sensible: Nor will the Parallax of *Saturn*, (though when in Opposition to the Sun, and next to *Jupiter*) be much greater; and therefore 'twill be very difficult for the Jovial Astronomer to estimate the Distance of *Saturn*, or of the Sun, from that Planet.

Indeed, if he can discover that *Jupiter* moves round the *Sun*, he may be able (as the Doctor shews, *Prop. 3.*) to determine the Ratio of the Distance of *Jupiter* and *Saturn* from the *Sun*, otherwise not.

Our *Jovial Astronomer* therefore, by the Help of his Senies, would distinguish two kinds of Planets; four nearer to him, which are the Satellites, and two (as the *Sun* and *Saturn*) more remote; and these latter would appear with a lesser Diameter, the former with a greater: Of the remotest, the *Sun* would appear in a Diameter about six Minutes, but the Diameter of *Saturn* would scarce be $\frac{1}{2}$ of a Minute.

Of the four nearer Planets or Satellites, the Fourth would appear to an Eye in *Jupiter* of the Bigness the Moon doth to us; that is, with a Diameter five times greater, and a Disk twenty five times greater than the *Sun* doth there: Besides, the four nearer, and apparently greater ones, will be distinguished from the more remote and lesser ones, in this, That in the nearer Planets, the Squares of the Periodick Times, are as the Cubes of their Distances from the Center of *Jupiter*; which would by no means be true, if any one of the greater were compared with any one of the lesser. And although the nearer these Planets are, they appear the greater; yet the *Sun* will be immensely more bright than they; for from their Faces, which depend upon their Situation, with respect to the *Sun*, they will appear like so many Moons: From whence a Spectator in *Jupiter* will have four kinds of Months, according to the Number of Moons. There will be contained above 2407 of the least Months in a Year, and about half the Number of Months next to these: The Number of the Months of the third Satellite contain'd in a Year, will be nearly subduple of the second, or subquadruple of the first; and the Months of the greatest will be about 254: So that although the Notation of Time be much more intricate in *Jupiter*, by reason of the great Number of Days which their Year contains; yet it is much facilitated by these four kinds of Months; for in the least Month there are only 4 Days and a Quarter, but in the greatest something more than 40.

Besides, these Moons suffer an Eclipse when they, being in Opposition to the *Sun*, happen to fall into the Shadow of *Jupiter*; and again, when they, (being in Conjunction with the *Sun*, project their Shadows to *Jupiter*, they make an Eclipse of the *Sun* to an Eye placed in that Region of *Jupiter*, where the Shadow falls (which Region is a very small part of *Jupiter's* Surface) just as our Moon does: But because the Orbits of those Moons about *Jupiter*, are in a Plane which is inclined to, or makes an Angle with *Jupiter's* Orbit about the *Sun*, and are all of them nearly in the same Plane, excepting the second, which deviates a little; upon this Account, I say, their Eclipses are Central, and consequently most lasting, when the *Sun* is in one of the Nodes of those Moons: But when the *Sun* is out of this Position, the Eclipses may be Total, though not Central, because the Breadth of *Jupiter's* Shadow, is nearly decuple the Breadth of any of the Satellites; and the apparent Diameter of any of those Moons, is nearly quintuple the apparent Diameter of the *Sun*. And this remarkable Inequality of the Diameters, and the small Inclination the Plane of the Orbits of the Satellites has to the Plane of *Jupiter's* Orbit round the *Sun*, is the Reason why in each Revolution there happens Eclipses both of the Satellites and of the *Sun*, though the *Sun* be at a considera-

ble Distance from the Nodes: And the inferior of these Satellites, though the *Sun* to a Spectator in *Jupiter*, be at his greatest Distance from their Nodes, are nevertheless Eclipsed, and Eclipse the *Sun*; but the remotest of them in this Case, for two Years together, escapes falling into *Jupiter's* Shadow, and *Jupiter* into its Shadow; and the Phenomena of partial Eclipses in the intermediate Times and Places, will be apparent to a Spectator in *Jupiter*. Further, it sometimes happens here, that one Moon Eclipses another, whose Phasis is sometimes very different, nay, contrary to the Eclipse of a Moon, falling into the Shadow of *Jupiter*, which was described above; for in this the Oriental Limb is first darkened, and the Occidental Limb emerges last; but in others of them the Occidental Limb is first darkened, and the Oriental Limb emerges last; and in others contrarily.

The Shadow of *Jupiter*, though it go far beyond its Satellites, yet does not reach any other Planet, as the Shadow of all other primary Planets do; for no other Planet, except *Saturn*, could be immersed in it, tho' it was infinite; but the Shadow of *Jupiter* cannot reach *Saturn*, except the Diameter of *Jupiter* were half the Diameter of the *Sun*, and it is scarce $\frac{1}{2}$ of it.

If the Surface of *Jupiter* were chiefly Water, and we suppose the Seas there to be Navigable, the Sailors would have great Advantages, as well because the Nights are very short, and very light from the Numbers of their Moons; as because these Moons would be of singular use to 'em in directing their Courses.

For from those manifold Eclipses, the Longitude of a Place would be easily determined, and Hydrographical Tables accurately constructed, which is very Advantageous in so vast a Globe as that of *Jupiter*; whose Surface being Centuple, (nay, according to *Hugens*, 400 times as much) the Surface of the Earth would render its Mensuration very laborious: But the Flux and Reflux of the Sea, occasion'd by these four Moons, (for the Force of the *Sun* would be very little there) would be very different, and besides, would be very difficultly brought to a Calculation.

JURATS, are in the Nature of Aldermen, for Government of their several Corporations: As the *Mayor* and *Jurats* of *Maidstone*, *Rye*, *Winchelsea*, &c. So *Jersey* hath a Bayliff and Twelve *Jurats*, or (worn Assistants, to Govern the Island.

JURISDICTION, is a Dignity which a Man hath conferred on him to do Justice in Cases of Complaint.

JURIS Utrum, is a Writ that lieth for the Incumbent, whose Predecessor hath alienated his Lands or Tenements.

JUROR, is one of those twenty four or twelve Men, which are sworn to deliver a Truth upon such Evidence as shall be given them touching the Matter in question.

JURY, in Common Law, signifies either twenty four or twelve Men sworn to enquire of the Matter of Fact, and declare the Truth upon such Evidence as shall be delivered them touching the Matter in Question: Of which *Jury* some may, and some may not be impannel'd: See *F. N. B. Fol. 165.*

In *England* there are three sorts of Trials, viz. one by Parliament, another by Battle, and the third by *Affize* or *Jury*.

The Trial by *Affize*, (be the Action Civil or Criminal, Publick or Private, Personal or Real) is referred

ferred for the Fact to a Jury, and as they find it, so passeth the Judgment.

This *Jury* is not only used in Circuits of Justices Errant, but also in other Courts and Matters of Office: And though it appertains to most Courts of the Common Law; yet it is most notoriously in the Half-year Courts of the Justices Errants, commonly called, the *Great Assizes*; and in the Quarter-Sessions, and in them it is most ordinarily called a *Jury*, and that in a Civil Cause; whereas in other Courts 'tis usually called an *Inquest*, and in the Court-Baron, a *Jury of the Homage*.

In the *General Assize* there are usually many *Juries*, because there be store of Causes both Civil and Criminal commonly to be tried; whereof one is called, *The Grand Jury*, and the rest *Petite Juries*; whereof it seemeth there should be one in every Hundred.

The *Grand Jury* consists of Twenty four Grave and Substantial Gentlemen, or some of the better sort of Yeomen, chosen indifferently by the Sheriff out of the whole Shire, to consider of all Bills of Indictment preferred to the Court; which they do either approve, by writing upon them, *Billa Vera*; or disallow, by indorsing *Ignoramus*. Such as they do approve, if they touch Life and Death, are further referred to another *Jury* to be considered of, because the Case is of such Importance; but others of lighter Moment, are upon their Allowance, without more Work, fined by the Bench; except the Party traverse the Indictment, or challenge it for Insufficiency, or remove the Cause to a higher Court by *Certiorari*; in which two former Cases it is referred to another *Jury*; and in the latter, transmitted to a higher: And presently upon the Allowance of this Bill by the Grand Inquest, a Man is said to be indicted: Such as they disallow are delivered to the Bench, by whom they are forthwith cancelled or torn.

The *Petite Jury* consists of Twelve Men at the least, and are empanelled as well upon Criminal, as upon Civil Causes: Those that pass upon Offences of Life and Death, do bring in their Verdict, either Guilty, or not Guilty; whereupon the Prisoner, if he be found Guilty, is said to be Convicted, and so afterwards receiveth Judgment and Condemnation; or otherwise is acquitted and set free. Those that pass upon Civil Causes Real, are all, or so many as can conveniently be had, of the same Hundred where the Land or Tenement in Question doth lie, being four at the least; and they, upon due Examination, bring in their Verdict either for the Demandant or Tenant.

JURY-MAST, so the Seamen call whatever they set up in the room of a Mast lost in a Fight, or by a Storm; which, if they can save it, some great Yard, which they put down into the Step of that lost Mast, fastening it into the Partners, and fitting to it the Miffen, or some lesser Yard, with Sails and Ropes, as they can, they make a hard shift to sail with it instead of the Mast which they have lost.

JUSTICE, signifies him that is deputed by the King to do Right by way of Judgment. Of these *Justices* there are divers sorts in England; of the manner of whose Creation, with other Appurtenances, read *Fortesque, Cap. 51*.

JUSTICE of the Common-Pleas, is a Lord by his Office, and with his Assistants originally did hear and determine all Causes at the Common Law; that is, all Civil Causes between Common Persons,

as well Personal as Real; for which Cause it is called, *The Court of Common-Pleas*, as distinguishing it from *The Pleas of the Crown*, or the *King's Pleas*, which are Special, and appertaining to him only.

JUSTICE of the Forest, or *Justice in Eyre of the Forest*, is a Lord by his Office, and hears and determines all Offences within the Forest, committed against Venison or Vert: Of these there be two, whereof one hath Jurisdiction over all Forests on this Side Trent, the other of all beyond.

JUSTICE of the King's-Bench, is a Lord by his Office while he enjoys it, and the Chief of the rest: His Office (especially) is to hear and determine all Pleas of the Crown, viz. such as concern Offences committed against the Crown, Dignity, and Peace of the King; as Treasons, Felonies, Mayhems, and such-like: He also, with his Assistants, heareth all Personal Actions, and Real also, if they be incident to his Jurisdiction.

JUSTICES of Assize, are such as were wont by Special Commission to be sent into this or that County, to take Assizes for the Ease of the Subjects; for whereas these Actions pass always by Jury, so many Men might not, without great Damage and Charge, be brought up to London, and therefore Justices for this Purpose, by Commission particularly authorized, were sent down to them: And twice every Year they go the Circuit, by two and two, through all England, dispatch their several Businesses by several Commissions; for they have one Commission to take Assizes, another to deliver Gaols, and another of Oyer and Terminer, &c.

JUSTICES in Eyre, are those who were sent with Commission into divers Counties to hear Causes, especially those that were termed *Pleas of the Crown*: And this was done for the Ease of the People, who would else have been hurried to the *King's-Bench*, if the Cause were too high for the County-Court.

JUSTICES of Gaol-Delivery, are such as are sent with Commission to hear and determine all Causes appertaining to such, as for any Offence are cast into the Gaol.

JUSTICES of Nisi Prius, are now all one with *Justice of Assize*; for it is a common Adjournment of a Cause in the *Common-Pleas*, to put it off to such a Day, *Nisi prius justiciarii venerint ad eas partes ad capiendas Assisas*: And upon this Clause of Adjournment, they are called *Justices of Nisi Prius*, as well as *Justices of Assize*, by reason of the Writ or Action they have to deal in.

JUSTICES of Oyer and Terminer, were Justices deputed upon some special or extraordinary Occasion, to hear and determine some peculiar Causes.

JUSTICES, is a Writ directed to the Sheriff, for the dispatch of Justice in some Special Cause, of which he cannot by his ordinary Power hold Plea in his County-Court.

By this Writ *Justicies*, the Sheriff may hold Plea of a great Sum; whereas of his ordinary Authority he can hold no Pleas, but of Sums under forty Shillings.

JUXTA-POSITION, is the ranging the Particles or Corpuscles of any mix'd Body into such an Order, Position, or Situation, that the Particles being contiguous to one another, shall determine or denominate a Body to be of such a Figure or Nature, or to be indued with such Properties as are the proper Result of such a Configuration and Disposition of Parts.

K E E

KALENDAR : See *Calendar*.

KALENDS : See *Calends*.

KECKLE ; when the Cables of a Ship gaul in the Hawse, or the Bolt-ropes do so against the Ship's Quarter, the Seamen wind some small Ropes about them ; and this serving of these Ropes is called *Keckling*.

KEDGING, at Sea, is when a Ship is brought up or down in a narrow River, the Wind being contrary to the Tide, and yet she is to go with the Tide ; then they use to set their Fore-sail, or Fore-top-sail and the Muffen, and so let the Ship drive with the Tide, that so they may flat her about ; and if she happen to come over too near the Shoar, they have a small Anchor in the Head of their Boat with a Hawser fastened to it from the Ship, which Anchor they then let fall in the Middle of Stream, and so wind or turn her Head about, lifting the Anchor up again when she is come fully about : This Work is called *Kedging*, or to *kedge* up a River, and the Anchor made use of is called the

KEDGER, or *Kedge-Anchor*.

KEEL, is the lowest Piece of Timber in a Ship, in the Bottom of her Hull ; one End whereof is at the Stern, the other at the Stem : Into this are all the Ground-Timbers and Hooks fastened, and bolted fore and aft. When a Ship hath a deep Keel, she is said to have a *Rank Keel* ; and this serves well to keep her from rowling ; but if she is over-floaty and rowls too much, a new Keel is sometimes put on, called a *False Keel*.

KEEL-ROPE, a Hair-Rope running between the Keelson and the Keel of a Ship, to clear and Limber-Holes when they are choaked up with Balast, &c.

KEELSON, the next Piece of Timber in a Ship to her Keel, lying right over it next above the Floor-Timber.

KEEPER of the Great Seal, is a Lord by his Office, and stiled *Lord-Keeper of the Great Seal of England* : He is one of the King's Privy-Council ; through whose Hands pass all Charters, Commissions, and Grants of the King under the *Great Seal* ; without which *Seal* all such Instruments by Law are of no force : For the King is, in the Interpretation of Law, a Corporation, and passeth nothing firmly but under the said Seal, which is as the publick Faith of the Kingdom, in the high Esteem and Reputation justly attributed thereto.

This *Lord-Keeper* hath the same Place, Authority, Preheminence, Jurisdiction, Execution of Laws, and all other Customs, Commodities, and Advantages, as the *Lord-Chancellor* of England hath for the Time being. He is constituted by the Delivery of the *Great Seal* to him, and taking his Oath.

KEEPER of the Privy Seal, is a Lord by his Office, through whose Hands pass all Charters signed by the King, before they come to the *Great Seal*, and some things which do not pass the *Great Seal* at all. He is of the King's Privy-Council, and one of the Great Officers of the Kingdom.

KEEPER, or *Chief Warden of the Forest*, is he who hath the principal Government of all things belonging to the same.

KENKS, in the Sea Phrase, are Doublings in a Cable or Rope, when 'tis handed in or out, so that

K N E

it doth not run smooth ; or when any Rope makes Turns, and doth not run smooth and clever in the Block, they say it makes *Kenks*.

KENNETS, in a Ship, are small Pieces of Timber nailed to the Inside of the Ship, unto which the Tacks and Sheets are belayed, (as they call it ;) i. e. fastened.

KETCH, a smaller Vessel, but of the same Form with a *Hoy*.

KEVELS, or *Cheviols*, are small Pieces of Timber nailed to the Inside of a Ship, unto which the Tacks and Sheets are belayed or fastened.

KEY, in Musick, is a certain Tone, whereto every Composition, whether it be long or short, ought to be fitted or design'd : And this Key is said to be either *Flat* or *Sharp*, not in respect of its own Nature, but with Relation to the *Flar* or *Sharp Third*, which is joined with it : See *Musick*, Vol. II.

KIDNEYS : see *Reins*.

KINGDOM, a Term used by the Chymists, who, according to their Cant in other things, call the Three Orders of Natural Bodies, *Animal*, *Vegetable*, and *Mineral*, by the Name of *Kingdom*.

Thus they would say, Those Bodies which belong to the *Animal Kingdom*, abound most in Volatile Salt.

KING'S-BENCH, is the Court or Judgment-Seat, where the King of England was sometimes wont to sit in his own Person ; and therefore it was moveable with the Court or King's Household, and called *Curia Domini Regis*, and *Aula Regia*, as *Gwin* reports in his Preface to his Reading, and that therein, and in the Court of Exchequer, which were the only Courts of the King till Henry the Third's Days, were handled all Matters of Justice, as well Civil as Criminal.

This Court of the *King's-Bench*, was wont in Ancient Times to be especially exercised in all Criminal Matters and Pleas of the Crown, leaving the handling of private Contracts and Civil Actions to the *Common-Pleas*, and other Courts.

KNAVE-LINE, is a Rope in a Ship, fastened to the Cross-Trees under the Main or Fore-Top, whence it comes down by the Ties to the Ramhead, and there 'tis reeved through a Piece of Wood of about two Foot long, and so is brought to the Ship's Side, and there haled up taught to the Rails.

Its Use is to keep the Ties and Hallyards from turning about one another, as they are apt to do when new and first used ; and therefore after they are a little used and stretched, this *Knave-Line* is taken away, of no further Use.

KNECK, in the Sea-Language, is the twisting of a Rope or Cable as it is veering out.

KNEES, are Pieces of Timber in a Ship bowing like a Knee, which are used to bind the Beams and Futtocks together, being bolted strongly into them both.

Hence such Timber as is useful for this Purpose, is called,

KNEE-TIMBER : Thus the Cut-water of a Ship, is called, *The Knee of the Head*.

KNETTELS ; so the Seamen call two Pieces of Spun-yarn put together untwisted.

KNIGHTS, a-board a Ship, are two Pieces of Timber, in each of which go four Shivers, three for

for the Halliards, and one for the Top-Ropes. They are usually shaped into the Form of some Head; one of them standeth aft the Main-mast, and therefore is called the *Main-Knight*; the other standeth abaft the Fore-mast on the second Deck; and this is called the *Fore-Knight*.

KNIGHT-SERVICE was a Tenure, whereby several Lands in this Nation were held of the King, which drew after it Homage, Escuage, Wardship, Marriage, &c. but taken away by 12 Car. II. cap. 24.

KNOTS; there are two sorts of Knots used at Sea, one they call a *Bowlin-Knot*, because by this Knot

the Bowlin Bridles are fastened to the Crengles: This is very fast, and will not slip.

The other is a *Wale-Knot*, which is a round Knob or Knot, made with 3 Strands of a Rope; this Knot serves for the *Top-sail-Sheets* and *Stoppers*.

The Divisions also of the Log-Line are called Knots: These are usually seven Fathom, or forty two Feet asunder, but they should be Fifty Feet; and then as many Knots as the Log-Line runs out in half a Minute, so many Miles doth the Ship sail in an Hour; supposing her to keep going at any equal Rate, and allowing for Yaws, Leeway, &c. See *Log*.

LAC

LABEL, is a long thin Brass Ruler, with a small Sight at one end, and a Center-hole at the other; commonly used with a Tangent-line on the Edge of a Circumferenter, to take Altitudes, &c.

LABIA LEPORINA, are such Lips, as by reason of their ill make will not come together, which some call *Rostra leporina*; we have Lips.

LABIAL Letters, are (by the Grammarians) accounted such, as in their Pronunciation require chiefly the Use of the Lips to form their Sound.

LABORANT, he that attends on and works under a Chymist, while he is about any Process or Experiment.

LABORALIS, in the Common Law, is a Writ that lies against such as having not whereof to live, do refuse to serve; or for him that refuseth to serve in Summer where he served in Winter.

LABORATORY, or *Elaboratory*, a Room fitted out purpose for Chymical Operations, and furnished with Variety of Furnaces and Instruments necessary to that Art.

LABYRINTH, is the Second (some say the Third) Cavity of the Ear, hollowed in the *Os Petrosum*; and is made of three winding semi-circular Pipes, which open by five Orifices into the *Vestibulum*.

LAC LUNÆ, or *Flores Argenti*, is the Chymists Word for a white porous friable Earth, insipid, but dissoluble in Water, which it will tinge with a milky Colour: It is a *Sublimate* from a Matter commonly found in Silver Mines, whence the Name.

LACERTUS: see *Brachium*.

LACHRYMALE Punctum, vel *Foramen*, is an Hole in the Nose, by which the Matter or Liquor of the Tears passes to the Nostrils. If this Hole grow hard and brawny, from an Ulcer in one of the Glandules at the Corners of the Eyes, thence arises a *Fistula Lachrymalis*.

LACHRYMÆ, are a Moisture which is separated by the Glandules of the Eye to moisten the Eyes; which if it be too much, so that it cannot be received by the *Punctum Lachrymale*, it falls from the Eyes in Drops, and is called Tears.

Whatever also is strained through, and drops out naturally, is let out by Incision, from any Part of a Plant, whether it be Gum, Resin, Oil, &c. is called *Lachryme*.

LACONICUM, *Caldarium* and *Assa*, or *Balneum acreum*, was formerly a Cellar made to provoke Sweat; which was done by an Hor Vapour, or a Dry Heat included therein. *Blanchard*.

LAM

LACTEAL Veins, or *Vessels*: see *Vasa Lactea*.

LACTUCIMINA, the same that *Apthe*.

LACTUMIÆ, the same that *Achores*.

LACUNAR, in Architecture, is an arched Roof or Ceiling, more-especially the Planking or Flooring above the *Portico's*.

LACUNÆ, are little Pores or Passages in the *Vagina* of the Womb, but no where greater than in the lower Part of the Urinary Passage: There flows a certain serous pituitous Matter out of these *Ductus's*, which lubricates the *Vagina*.

LADDERS in a Ship, are usually Three: The *Entring-Ladder* is in the *Waste*, and made of Wood. The Second is the *Gallery-Ladder*, made of Ropes, and hung over the Galleries and Stern of Ships, and are to enter by the Stern of the Ship, out of the Boat, when the Weather is foul, and the Sea high. The Third, viz. *Boltspirit-Ladders* are at the *Beak-Head* made fast over the Boltspirit, to get upon it; and are only used in great Ships.

LADLE, an Instrument to load great Guns with Powder. It ought to be so proportioned, that two Ladles-full may charge the Piece: Therefore their *Breadth* must be 2 Diameters of the Shot; and their *Length* for double-fortified Cannon 2 and $\frac{1}{2}$ of the Shot; for ordinary Cannon it must not exceed 2; but for Culverins and Demi-Culverins, it may be three Diameters of the Shot; and 3 and $\frac{1}{2}$ for lesser Pieces, in order to load at twice: If you would load at once, this *Length* of the Ladle must be doubled; and observe this, That a Ladle 9 Balls in Length, and 2 Balls in Breadth, will hold just the Weight of the Iron Shot in Powder.

LAMBITIVE, a pectoral Medicine, to be lick'd off the End of a piece of Licorice-stick, the same with *Eclegma*: which see.

LAMBOIDES, is the backward Suture of the Brain, so called, from its Likeness to the Letter Λ or *Lambda*.

LAMELLÆ, are the little thin Plates, constituted by a Net-work of very small Fibres, of which the *Shells* of Shell-fishes consist, or are composed.

LAMINÆ, the Plates or Tables of the Skull, being two in Number; whereof the outer is thicker and smoother; but the inner more hard, and furrowed on its inner Surface.

LAMPADIAS, a kind of bearded Comet, resembling a burning Lamp, being of several shapes; for sometimes its Flame or Blaze runs tapering upward like unto a Sword, and sometimes it is double or triple-pointed.

LANCETTE, is a Chyrurgeon's little Knife, straight-pointed, two-edged; used in opening Veins, cutting of Fistula's, opening of the Fundament, Yard, or Womb that is shut.

LAND-Fall, a Sea-Term, signifying to fall in with the Land: Thus when a Ship out at Sea, expects to see Land in a little time, and it so happens that she doth, they say, That they have made a good Land-fall.

LAND-layed; they say, The Land is layed, when a Ship is just got out of Sight of the Land.

LAND-lock'd: A Ship is said to ride Land-lock'd when she is at Anchor in such a Place where there is no Point open to the Sea; so that she is safe from the Violence of Winds and Tide.

LAND-shut-in, is when another Point of Land hinders the sight of that which a Ship came from; then they say, The Land is shut in.

LAND-To, is when a Ship lies so far off from the Shore, that she can but just ken Land; then she is said to lie Land-to.

LANGREL-Shot, is a sort of Shot used at Sea: It is made of two Bars of Iron, with a Joint in the middle; by which means it can be shortened, and so put the better into the Gun; and at each End there is an half Bullet, either of Lead or Iron: when 'tis discharged, it flies out at length, and is of use to cut the Enemies Rigging, &c.

LANIS *de crescentia Wallie traducendis absque Custuma*, &c. is a Writ that lieth to the Customer of a Port, for the permitting one to pass over Wools without Custom, because he hath paid Custom in Wales before.

LANNIERS, or *Lanniards*, in a Ship, are small Ropes reeved into the *Dead-mens-eyes*, of all the *Shrowds* and *Chains*: Their Use is to slacken, or set taught the *Shrowds*; The *Stays* also of all *Masts* are set taught by *Lanniers*: That Rope which fastens the *Stopper* of the *Halliards* to them, is also called a *Lannier*.

L'ANSPESEADE, is an inferior Officer subordinate to the Corporal, to assist him in his Duty, and supply his Place when he is absent: He is exempt usually from all common Duty, except the *Rounds*, and *Sentinels Perdue*.

LAPIDESCENT, that which can turn any Body into a stony Nature: Thus those Waters, which by having some stony Particles dissolved and swimming in them, do in their Course deposit them on the Leaves, Grasse, Sticks, &c. that they run over, and so produce what are called Petrifications; these are properly *Lapidescent Waters*.

LAPIS Infernalis: see *Infernal Stone*.

LAPIS Prunelle: see *Sal Prunelle*.

LAPIS Medicamentosus, is made of two Ounces of Colcothar; Litharge, Alom and Bole-armoniack, of each 4 Ounces, mingled and put into an unglazed Pan; and then good Vinegar is poured upon it, to cover it 2 Fingers Height: Cover it, and let it stand 2 Days in Digestion; then add 8 Ounces of Nitre, and 4 Ounces of Sal-armoniack; and setting the Pot over the Fire, evaporate all the Moisture; after which calcine the remaining Mass, and keep it for Use. 'Tis dissolved in Water, when used, and is a famed Styptick. *Colius* gives a Description of a *Lapis Medicamentosus*, but *Lemery* prefers this before it.

There is also a Stone called *Lapis Admirabilis*, whose Composition see in *Lemery*, ult. Edit. p. 429. Also another called *The Philosopher's Stone*, ibid.

LAQUEUS, in Chyrurgery, is a Band so tied, that if it be attracted, or pressed with Weight, it shuts up close: Its Use is to extend broken or dis-

jointed Bones, to keep them in their Places when they are set, and to bind the Parts, close together.

LARBOARD, the Left-hand side of a Ship, when you stand with your Face to the Head.

LARCENY, in Law, is a wrongful taking away another Man's Goods, with a Mind to steal them; and in respect of the Thing stolen, is of two sorts, viz. *Great*, which is called *Theft simple*, where the Things stolen exceed the Value of Twelve Pence, and that is *Felony*: and *Petis Larceny*, when the Goods stolen exceed not the Value of Twelve Pence.

LARGE: The Sea-men say, a Ship goes or fails Large, when she goes neither before the Wind, nor upon a Wind, but as it were quartering between both. Wherefore *Large*, *Quartering*, *Veering*, *Lasking*, or *Roamer*, are all of the same Signification.

LARMIER, a square Member in *Architecture*, which is placed on the *Cornice* below the *Cymatium*, and jets out farthest; being so called from its Use, which is to disperse the Water, and to cause it to fall at a Distance from the Wall, Drop by Drop, or as it were by Tears: for *Larme* in French signifies a Tear: see *Corona*.

LARYNGOTOMIA, the same with *Bronchotomia*.

LARYNX, is properly the Head or Top of the Wind-pipe, or *Aspera Arteria*; and it consists of Five Cartilages. The First Pair is called *Scutiform*, because something like a Shield, which constitutes the Protuberance in the Neck, called *Adam's Apple*: The Second Pair is called *Annular*, because it is round like a Ring: The Third and Fourth Cartilage some reckon but one; but if the Membrane be taken off, it appears to be Two, and is called *Guttulis* and *Glottis*: The Fifth is called *Epiglottis*, which covers the Opening of the Wind-pipe at the Top. Its Use is in the Formation of the Voice and Respiration.

LASH, the Sea Word for binding up to the Ship's side, the Muskets, Buts of Water or Beer, or Pieces of Timber to make *Fishes* or spare Top-Masts; or when any thing is thus fastened to the Ship, 'tis called *Lashing*.

But the *Lashers* are properly those Ropes only which bind fast the Tackles and the Breeches of the Ordinance, when they are haled or made fast within Board.

LASHED, a Sea-Term, signifying made fast: The Carpenter ought to take Care that there be spare Yards lashed fast to the Ship's sides; i. e. fastened there to use on Occasion.

LASKETS, or *Latches*, are small Lines like Loops, fastened by sewing into the *Bonnets* and *Drablers* of a Ship; in order to lace the *Bonnets* to the *Cowfles*, or the *Drablers* to the *Bonnets*.

LASKING, when a Ship sails neither by a Wind, nor directly before the Wind, she is said to go *Lasking*; which is much the same as *Veering*, or going with a Quarterly Wind.

LASSITUDE: see *Copus*.

LASSITUDO *Ulcerosa*, is a Symptom usually attending the cold Fit of an intermitting Fever, consisting in a Soreness and Weariness of all the Joints and Bones.

LATCHES, are those Parts of a Clock, which lock up and unlock the Work.

LATERAL Equation, in *Algebra*, is such an one which hath but one Root; whereas every Quadratick hath 2, every Cubick 3 Roots, &c. And such Equations can be determined and constructed by the Intersection of two Right Lines, which is a Composition of $1 + 1 = 2$. But a Quadratick cannot

cannot be determined or constructed without a straight Line and a Circle cutting each other: See *Wallis's Algebra*, p. 275. *Engl. Edit.*

LATION, is the Translation or Motion of a Body from one Place to another in a Right Line ; and so is much the same as *Local Motion*.

LATISSIMUS Dorsii, or *Anscalptor*, or *Tersor*, is a Muscle of the Arm, which receives its first Appellation from its large Dimensions, it with its Partner covering the whole Back; the latter from the Use that is sometimes made of it: Its thin, broad, tendinous Origination is continued from the Seven Inferior Spires of the *Vertebrae* of the *Thorax*, and all those of the Loins and Superior Parts of the *Os Sacrum*, and the Posterior Part of the *Os Ilium*; beginning to grow Carnous as it passes over the *Longissimus Dorsii* and *Sacrospinalis*; and in its Progress over the Curvated Part of the Ribs, it receives several *Fasciculi* of fleshy Fibres arising from thence, which by their Conjunction compose a thick Body, still lessening it self in its Dimensions, as it marches towards the *Axilla*; and running over the Inferior Angle of the *Scapula*, from whence sometimes does arise a fleshy Part of it, which I have observed (says M. *Comper*) in those Bodies in whom the *Teres Minor* was absent, is at last inserted, by a short, but flat strong Tendon, to the *Os Humeri*.

LATITAI, is a Writ whereby all Men in Personal Actions are called Originally to the *King's Bench*: And it hath this Name, as supposing that the Defendant doth lurk and lie hid; and therefore being served with this Writ, he must put in Security for his Appearance at the Day. And by this Writ, a Man being brought in, is committed to the Marshal of the *King's Bench*; in whose Custody when he is, he may be sued upon an Action in that Court.

LATITUDE of a Place, is an Arch of the Meridian of that Place, intercepted between its *Zenith* and the *Equator*: Or 'tis an Arch of the Meridian, intercepted between the *Pole* and the *Horizon*; and therefore called the *Poles Height*, &c. It's counted on the brazen Meridian on the Globes.

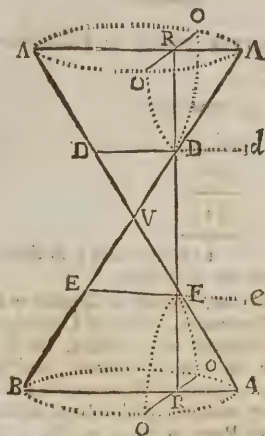
LATITUDE, in *Navigation*, is the Distance of a Ship from the Equinoctial, either North or South, and is counted on the Meridian: so that if a Ship sail towards the Equinoctial, she is said to *depress the Pole*; but if she sail from the Equinoctial, or from a lesser Latitude to a greater, she is said to *raise the Pole*: And whenever a Ship sails to or from the Equinoctial, either North or South, her Way gain'd thus is called her *Difference of Latitude*.

LATITUDE of a *Star* or *Planet*, is its Distance from the *Ecliptick*, being an Arch of a Circle of Longitude, reckoned from the *Ecliptick* towards its Poles.

LATITUDE *Heliocentrick* of a Planet : See *Heliocentrick*.

LATUS Rectum, a Term in Conicks, being the same with the Parameter; which see.

LATUS *Transversum* of the Hyperbola, is a Right Line lying between the Vertexes of the two *Opposite Sections*: Or that Part of the Common Axis which is between the Vertexes of the Upper and Lower Cone, as the Line *ED* in the following Figure; where also *dd* and *Ee* may be the *Parameters*, or *Latus Rectum*, belonging to the two opposite Sections *GLRO*, and *OEOR*.



To this *Latus Transversum* answers the longest Diameter in the *Ellipsis*, which *Apollonius* calls the *Transverse Axis* or Diameter.

LATUS *Primarium*, is a Right Line belonging to a Conick Section, drawn thro' the Vertex of the Section of the Cone, and within it; as the Line *EE* or *DD* in the preceding Figure.

LAVAMENTUM, the same with *Fobus*.

LAUDAUM, is meant only of a Medicine made of an *Opiate*, and that they call an *Opiate Laudanum*, from its excellent Qualities. 'Tis an Extract of the finer and purer Part of Opium, made with Water and Spirit of Wine, and then evaporated to its due Consistence: Of this there are many ways, but *Lemery's* seems the best: See his *Course of Chymistry*, last Edit, p. 618.

LAUNCH, in the Sea Phrase, is to put out: Thus they say, Launch a Ship out of the Dock, or out of the Key; Launch the Boat, Launch the David in or out; Launch our the Captain Bars. Also when they have hoisted up a Yard high enough, they say, in another Sense, Launch ho! that is, Hoist no more: Also in stowing any thing in the Hould of a Ship, they cry, Launch aft or Launch forward on: so when they are pumping, if the Pump sucks, they say Launch ho! that is, Pump no more.

LAWS of *Motion*: see *Motion*.

LAXATIVES, or *Loofening Medicines*, are those which, with their benign Particles, softning and scouring the Intestines, cleanse them of their Excrements.

LAY the Land, a Sea Phrase, which is used for sailing out of Sight of Land; for then they say, they have laid the Land: And if another Point of Land exclude the Sight of a former, they say, they have *sout* the first Land-in.

LEAP-YEAR, or *Bissextile*, is every fourth Year and so called from its *Leaping* a Day more that Year than in a Common Year: For in the Common Year any fixed Day of a Month changeth successively the Day of the Week; but in the *Leap-Year* it skips or *leaps* over one Day.

Note, The Common Year hath 365 Days in it, but the *Leap-Year* 366, and then *February* hath 29 Days, which in Common Years hath but 28.

To find the *Leap-Year* you have this Rule : 5

Divide by 4 ; what's left shall be,
For Leap-Year 0 ; for past, 1, 2, or 3.

H h h

Example:

Example.

In the Year 1701, what is it, a Common Year, or a Leap-Year.

4) 1701 (425

10

21

1 Remainder ; so that it is the First Year after the Leap-Year.

LEASE, in Law, signifies a Demise or Letting of Lands or Tenements, Right of Common, Rent, or any Hereditament unto another, for Term of Years or Life, for a Rent reserved ; and is either written, called a *Lease by Indenture*, or a *Lease Parol*. The Party that letteth this *Lease*, is called the *Lessor* ; and the Party to whom it is let, is the *Lessee* : And a *Lease* hath in it Six Points : 1. Words sufficient to import a Demise. 2. A *Lessee* named. 3. A Commencement from a Day certain. 4. A Term of Years. 5. A Determination. 6. A Reservation of Rent.

LEAVER : see *Lever*.

LEAVES, are the Notches of the Pinion of a Watch : see *Pinion*.

LEDGES in a Ship, are small Pieces of Timber lying athwart Ships, from the *Waste-Trees* to the *Roof-Trees*, which serve to bear up the *Nettings*, or the *Gratings* over the Half-Deck.

LEGACY, in Law, is a particular Thing given by a last Will and Testament : For if a Man transfer his whole Right or Estate upon another, that the *Civilians* call *Hereditary* ; and he to whom it is so transferred, they call *Heres* ; but in Common Law he is called *Heir* only, to whom all the Man's Lands and Hereditaments descend by Right of Blood : The former is *Heres factus*, the latter *Heres natus*.

LEE, a Word diversly used at Sea ; they mean generally by it, the Part opposite to the Wind : Thus the

LEE-Shore, is that on which the Wind blows ; and therefore to be under the Lee of the Shore, is to be close under the Weather-shore, or under Wind. When they say,

A-LEE the Helm, they mean, put the Helm to the Leeward side of the Ship. They say also, Take care of the

LEE-Latch, which is a Word of Command to the Man at the Helm, spoken by him that commands, or *Cons*, to take care that the Ship don't go to the Leeward of her Course : Wherefore they call a

LEEWARD Ship, one that is not fast by a Wind, or which doth not sail so near the Wind, nor make her Way so good as she should.

To lay a Ship by the Lee, or to come by the Lee, is to bring her so, that all her Sails may lie flat against her Masts and Shrouds, and that the Wind may come right upon her Broad-side. The way to do which, if all a Ship's Sails be abroad, is to bear up the Helm hard to Windward, to let rise the Fore-tack, veer the Main-sheet, and take in the Mizen-mast, or at least to peek it up ; which is called *Spelling the Mizen*.

LEE-FANG, is a Rope in a Ship, reeved into the *Crengles* of the Courses, when the Bottom of a Sail is to be haled in, that so the Bonnets may be laced on ; this Rope is also of use to take in the Sail,

LEET, and *Court-Leet*, is a Court out of the Sheriff's Turn, and inquires of all Offences under the Degree of High-Treason that are committed against the Crown and Dignity of the King. But those Offences which are to be punished with Loss of Life or Member, are only inquirable there, and to be certified over to the Justices of Assize.

LEETCH of a Sail, (aboard a Ship) signifies the outward Edge or Skirt of the Sail from the Earing to the Clew ; or rather the middle of the Sail between these two.

LEETCH-LINES, are small Ropes fastened to the Leetch of the Topails (only) and then reeved into a Block at the Yard, just by the Topail Ties. Their use is to hale in the Leetch of the Sail, when the Topails are to be taken in ; which is always first done, and then the Sail can be taken in with the greater Ease.

LEGAN : see *Flotson*.

LEGGS of the *Martnets*, is the Term for those small Ropes in a Ship, which are put thro' the Belt Ropes of the Main and Fore-sail, in the Leetch of each. They are above a Foot in Length, and at either End are spliced into themselves : They have also a small Eye, into which the *Martnets* are fastened by two Hitches, and the End is seized into the standing part of the *Martnets*.

LEGGS of a Triangle : When one side of a Triangle is taken as a Base, the other two are called *Leggs*.

LEGUMEN, in Botanicks, is that Species of Plants which we call Pulse ; and they are so named because they may be gathered by the Hand without cutting. Mr. Ray reckons all those Plants which have a *Papilionaceous*, or Butter-fly-like Flower, among the *Legumina*.

LEMMA, is a Term used chiefly by Geometrick Writers, and signifies a Proposition, which serves previously to prepare the way for the more easie Apprehension of the Demonstration of some Theorem, or for the Construction of some Problem. Thus to prove that a Pyramid is $\frac{1}{3}$ of a Prism or Parallelopiped of the same Base and Height with it, (the Demonstration of which, after *Euclid's* way, in Lines, is a little difficult to conceive) we may premise this Lemma ; which you will find proved under the Word *Progression*, That the Sum of a Series of the Squares of Numbers in Arithmetical Proportion, beginning from 0, and going on in the Natural Order ; as 0, 1, 4, 9, 16, 25, 36, &c. is always subtriple of the Sum of as many Terms equal to the greatest ; or, in other Words, is always $\frac{1}{3}$ of the greatest Term multiplied by the Number of the Terms.

Thus also to find the Inflection of a Curve Line, (if it hath any Inflection) this Lemma must be first premised, That a Tangent may be drawn to the given Curve in a given Point.

LENIENTIA, the same with *Laxantia*.

LENO and Linon, is that part of the Brain called *Torcular Herophili*, that Place where the third Cavity of the *Dura Meninx* is joined to the first, second, and fourth.

LENS, is a Term in Opticks for a small Convex, or Plano-Convex, a Concave, or Concavo-Convex Glass.

LENTA *Febris*, the slow or lingering Fever, is usually reckoned among the *Symptomatical*, and proceeds from some hidden Putrefaction sticking to some Bowel, so that its Substance is almost corrupted. Such a kind of Fever is often bred in the Consumption of the Lungs, and degenerates into an *Hætick*. *Blanchard*.

LENTI.

LENTIFORME *Prominences* : See *Corpora Striata*.

LENTIGINES, are what we call *Freckles*.

LEO, is the Fifth of the Twelve Signs of the *Zodiac*.

LEPIDOIDES, is the Scaly Suture of the Skull : See also *Mendosa*.

LEPRA *Arabum*, the same with *Elephantiasis Græcorum*.

LEPROSIE, is a dry Scab, whereby the Skin becomes scaly like Fish : It differs from *Leuce* and *Alphus*, in that a *Leprosie* is rough to the Touch, and causes an Itching ; for the Skin is the only Part affected, and therefore that being flead off, the Flesh underneath appears found and well.

LEPROSO *Amovendo*, is a Writ that lies for a Parish, to remove a Leper or Lazar, that thrusteth himself into the Company of his Neighbours, either in Church or in other Publick Meetings, to their Annoyance or Disturbance.

LEPTUNTICA, are attenuating cutting Medicines, which part or cut the crofs and viscous Humours with their acute Particles.

LEPUS, the *Hare*, a Southern Constellation, containing 13 Stars.

LESSER *Circles of the Sphere*, are those whose Planes do not pass through the Center of the Sphere ; and which do not divide the Globe into two equal Parts, but are parallel to *Greater Circles* : As the Tropicks and Polar Circles, and all Parallels of Declination and Altitude ; which latter being parallel to the Horizon, are called *Almacanters*.

LESSOR and *Lessee*, are Terms of the Common Law : The *Lessor*, is he that Leaseth our Lands or Tenements to another for Term of Life, for Years, or at Will : And the Person to whom such a Lease is made, is called the *Lessee*.

LETHARGUS, a *Lethargy*, is a Disease causing an heavy Sleep, like that Distemper called *Coma*, but accompanied with a Fever and a *Delirium* ; and is supposed to be an Heap of too much or incongruous moist Matter within the Pores of the *Cortical Substance* of the Brain. This Distemper does not seem to come of it self, but rather from the Demigration of Fevers.

LETTERS Patent, are Writings sealed with the Great Seal of *England*, whereby a Man is authorized to do or enjoy any thing that otherwise of himself he could not. And they are so termed of their Form, because they be open, with the Seal affixed, ready to be shewed for Confirmation of the Authority given by them. Common Persons may grant *Letters Patents* ; but they are rather call'd *Patents*, than *Letters Patents* to make *Denizens* ; yet for Difference sake, those granted by the King are called *Letters Patent Royal*.

LETTER of Attorney, is a Writing authorizing an *Attorney* ; that is, a Man appropriated to do a lawful Act in our stead : As a *Letter of Attorney* to give Seisin of Lands, to receive Debts, to sue a Third Person, &c.

LETT-FALL, the Word at Sea for putting out a Sail when the Yards are aloft, and the Sail is to come down from the Yard ; but when the Yards are stricken down, then the Sail is loosed below, before they hoist the Yard. Neither is it properly said of *Top-sails*, because they lie on the Top ; and therefore the Word for them is, *Heave out your Top-sails*. Nor can it be applied to the *Mizzen* ; for to it the Word is, *Strike the Mizzen*, and set it. So that in Strictness it belongs only to the *Main-sail*, *Fore-sail*, and *Sprit-sail*, when their Yards are hoisted up aloft.

LEVANT and *Couchant*, is when Cattel have been so long in another Man's Ground, that they have lain down, and are risen again to feed.

LEVARI Facias, is a Writ directed to the Sheriff, for levying of a Sum of Money upon Lands and Tenements of him that hath forfeited a Recognizance.

LEVARI Facias damna de disseisitoribus, is a Writ directed to the Sheriff, for the levying of Damages, wherein the *Disseisor* hath formerly been condemned to the *Disseissee*.

LEVARI Facias residuum debiti, is a Writ directed to the Sheriff, for the levying the Remnant of a Debt upon Lands and Tenements, or Chattels of the Debtor that hath in part satisfied before.

LEVARI Facias, quando vicecomes returnavit quod non habuit emptores, is a Writ commanding the Sheriff to sell the Goods of the Debtor which he hath already taken, and returned that he could not sell them, and as much more of the Debtor's Goods as will satisfy the whole Debt.

LEVATORES Ani, are Muscles, which arise fleshy from each side of the *Os Pubis*, internally within the *Pelvis*, as also from part of the *Os Ischium* and *Sacrum* : From these Places, like Lines drawn from a Circumference towards a Center, its Fibres descend over the *Musculi Mafsupiales* to their Implantation at the lower end of the *Intestinum Rectum* in the *Anus*. The Use of these Muscles is chiefly to suspend and draw the *Anus* upwards, lest the *Feces* should be burthenfom to the *Sphincter*.

LEVATOR Scapulae, is a Muscle of the Shoulder-Blade, by some called *Levator Patientie*, because we make use of it in large Inspirations, in order to expire ; as when we sigh (as they call it.) This lies immediately under the *Cucullaris*, arising by so many separate Originations from the Second, Third, Fourth, and Fifth Transverse Processes of the *Vertebrae* of the Neck ; which uniting into one large fleshy Body, descends obliquely to its Insertion at the superior Angle of the *Scapula* : Its Name declares its Office.

LEUCE, is a Cutaneous Disease, when the Hairs, Skin, and sometimes the Flesh underneath, turns white ; the Flesh being pricked with a Needle, is not sensible, nor emits Blood, but a Milky Humour. It differs from *Alphus*, in that it penetrates deeper, and changes the Skin, so that the Hairs are changed too.

LEUCOMA, is a White Scar in the Horny Tunick of the Eye ; the same with *Albugo*.

LEUCOPHLEGMATIA, is a pituitous Dropsy, or a Dropsy that seizes the whole Body ; which in the Beginning is called *Cachexia*, and differs from it only in Degree.

LEVEL of Carpenters, is an Instrument made of a long piece of Wood at bottom, and with an upright one to hold a Thread and Plummer, which plays about a perpendicular Line there drawn ; and when it falls exactly on it, then is the bottom piece in a true Level, or Horizontal Position.

LEVEL, is an Instrument made of Wood or Brass, with two Sights and a Glass, almost filled with coloured Spirit of Wine, but so as to leave room for a Bubble of Air to play up and down in it : It hath a Cover, divided into several equal Parts, whereby to adjust the Bubble ; with a Spring to fit it to the Three-legg'd Staff, and a long Screw, to rectify the Bubble by the Help of a Plummer that hangs on one of the Sights. Sometimes, instead of the long Screw and Spring, there is fitted a Rack, being two Semi-circles at Right Angles, with a Thread or Worm upon two endless Screws ; which,

with a Key, readily brings the Instrument to a true *Level*; and sometimes to help the Sight, there is added a *Telescope*. There also belongs to this Instrument two of more *Station-Staves*; and it is used by *Engineers, Surveyors, &c.* to find the true *Level* for conveying Water to supply Towns, making Rivers Navigable, draining Bogs, &c. See Vol. II.

LEVER, is the second *Mechanical Power*; and so considered, is only a *Balance* supported by a *Hypomochlion*; only the Center is not in the Middle; as it is in the common *Balance*, but near one End; for which Reason 'tis used to elevate or raise a great Weight; whence comes the Name *Lever*.

LEVIGATION, in Chymistry, is the *grinding* any hard Matter to a very fine, or as they say, an impalpable Powder upon a Marble, as the Painters grind their Colours.

LEVITY, is the Diminution or Want of Weight in any Body, when compared with another that is heavier; and in this Sense is opposed to *Gravity*. The Schools maintain there is no such thing as *Positive* or *Absolute Levity*; and this they would have to be the Cause of the Emergence of Bodies lighter in Specie than Water, up to the Surface of that Liquor. But besides that, the common Sense of Mankind discovers *Gravity* and *Levity* to be only Relative and Comparative Things; the Honourable Mr. Boyle hath by many Experiments shewn, That the rising of Bodies from the Bottom to the Surface of Water, if lighter specifically than it, is by no means solvable nor accountable by any such Notion as that of *Positive Levity*, but exactly agreeable to the Laws of the *Hydrostaticks*: See his *New Experiments about the Positive or Relative Levity of Bodies, and Hydrost. Paradoxes*.

LIBEL, signifies the Original Declaration of any Action in the Civil Law; as also a Criminous Report of any Man cast abroad, or otherwise unlawfully publish'd, and then called *Famofus Libellus*; and this is either *In Scriptis*, or *Sine Scriptis*: *In Scriptis*, is when an Epigram, or other Writing, is composed or publish'd to another's Disgrace, which may be done *Verbis aut Cantilenis*; as where this maliciously repeated or sung in the Prefence of others; or else *Traditione*, when the *Libel*, or any Copy of it, is delivered out to scandalize the Party. *Famofus Libellus sine Scriptis*, may be two-fold: 1. *Picturis*, as to paint the Party in a shameful and ignominious manner; Or, 2. *Signis*, as to fix a Gallows, or other ignominious Sign, at the Door of the Party, or elsewhere.

LIBELLO habendo: See *Copia Libelli deliberanda*.

LIBERA Chacea habenda, is a Writ Judicial, granted to a Man for a free Chace belonging to his Mannor, after he hath by a Jury proved it to belong to him.

LIBERTATE, is a Writ issuing out of the Chancery to the Treasurer, Chamberlains, or Barons of the Exchequer, or Clerks of the Hamper, &c. for the Payment of any Annual Pension, or other Sums granted under the Great Seal: Or sometimes to the Sheriff, &c. for the Delivery of any Lands or Goods taken upon Forfeits of Recognizance. It lies also to a Gaoler, for the Delivery of a Prisoner that hath put in Bail for his Appearance.

LIBERTATIBUS Allocandis, is a Writ that lies for a Citizen or Burgess of any City or Borough, that contrary to the *Liberities* of the City or Town whereof he is, is impeaded before the King's Justices, or Justices Errant, or Justice of the Forest, &c. to have his Privilege allowed.

LIBERTATIBUS Exigendis in Itinere, is a Writ

whereby the King willeth the Justices in Eyre to admit of an Attorney for the Defence of another Man's *Liberty* before them.

LIBERTY, is the Power a Man hath to do, or forbear doing, any particular Action, according as its Doing or Forbearance has the actual Preference in the Mind; which is the same thing as to say, according as he himself wills it.

LIBRA, one of the Twelve Signs of the *Zodiack*, being exactly opposite to *Aries*.

LIBRATION of the Moon, (see *Evection*) is of three Kinds:

1. Her *Libration in Longitude*; which is a Motion arising from the Plane of that Meridian of the Moon, (which is always, nearly, turned towards us) being directed not to the Earth, but towards the other Focus of the Moon's Elliptical Orbit; and so to an Eye on the Earth she seems to librate to and again in Longitude, or according to the Order of the Signs in the *Zodiack*. This *Libration* is of no Quantity twice in each Periodical Month; viz. when the Moon is in her Apogee, and in her Perigee; for the Plane of her Meridian abovementioned, is directed alike to both the Foci.

2. Her *Libration in Latitude*; which arises hence, That her Axis not being perpendicular to the Plane of her Orbit, but inclined to it, sometimes one of her Poles, and sometimes the other, will nod (as they call it) or dip a little towards the Earth; (as is the Case of the Poles of the Earth towards the Sun) and consequently she will appear to librate a little, and to shew sometimes more of her Spots, and sometimes less of them, towards each Pole: Which *Libration* depending on the Position of the Moon, in respect of the Nodes of her Orbit with the Ecliptick, (and her Axis being perpendicular nearly to the Plane of the Ecliptick) is very properly said to be in *Latitude*.

And this is completed in the Space of the Moon's Periodical Month; or rather while the Moon is returning again to the same Position, in respect of her Nodes.

3. There is also a *Third kind of Libration*, by which it happens, that though another Part of her is not really obverted to the Earth, as in the former *Librations*, yet another is illuminated by the Sun: For since her Axis is perpendicular nearly to the Plane of the Ecliptick, when the Moon is most Southerly, in respect of the Ecliptick North Pole; some Parts nearly adjacent to it will be illuminated by the Sun; while, on the contrary, the South Pole will be in darkness. In this Case therefore, if it happen that the Sun be in the same Line with the Moon's Southern Limit; then will she, as she proceeds from Conjunction with the Sun towards her ascending Node, appear to dip her Northern Polar Parts a little into the dark Hemisphere, and to raise her Southern Polar Parts as much into the Light; and the contrary to this will happen the next Fortnight, while the New Moon is descending from her Northern Limit; for then her Northern Polar Parts will appear to emerge out of Darkness, and the Southern Polar Parts to dip into it. And this *seeming Libration*, or rather these Effects of the former *Libration in Latitude*, depending upon the Light of the Sun, will be completed in her Synodical Month. Greg. Astron. Lib. 4. Sect. 10.

LICENSE to arise, is a Liberty given by the Court to a Tenant that is Efloined *de malo lecti* in a real Action: For the Law is, That in this Case he may not arise out of his Bed, or at least go out of his Chamber, until he have been viewed by Knights thereunto appointed, and have a Day assigned him

to appear : And the Reason of this is, That it may appear whether he caused himself to be Effoined deceitfully, or not ; and therefore if the Demondant can prove that he was teen abroad before the View or *License* of the Court, he shall be adjudged to be deceitfully Effoined, and to have made Default.

LICENTIA Surgendi, is a Writ whereby the Tenant Effoined *de malo lecti*, obtaineth Liberty to rise.

LICHEN, barbarously called by some *Serpigo* or *Zerma* : *Hallibabbus* calls it *Petigo* and *Sarpedo* ; the *Vulgar Voliaticita*. *Lichens* are certain Asperities of the Skin, and as it were Tumours, which itch much, and send forth Matter. The *Greeks* and *Arabians* have made two sorts of *Lichens* ; the one mild and gentle, the other fierce and cruel : And according to *Avicen*, some are moist ; which being rubbed, send forth a kind of Dew ; others are dry : And the Moist are more safe ; but the Dry is made of salt pituitous Matter, turn'd into Melancholy Blood. And again he writes, That one *Impetigo* brings off the Skin, by reason of its great Dryness, and another does not ; and that one is Ambulatory and Malignant, and another Fixed and Standing ; as also one is Old, another Fresh. Hence it appears, That the *Scabies* of *Corn*. *Celsus* was nothing but these *Lichens* of the *Greeks*, and the *Impetigo*, of the *Arabians*. It comes in any Part of the Body but especially in the Face and Chin, as *Galen* has it : For a *Lichen*, says he, is a most ungrateful Distemper in the Chin, because, it makes it itch exceedingly, and stretches out the Parts affected : It is not a little dangerous ; it spreads over the whole Face, and sometimes reaches the Eyes, and at last makes the Person affected extream filthy and loathsome. *Blanchard*.

LICHEN of the *Greeks*, is *Pliny's Impetigo*, or an Inequality of the Skin, extending it self to the neighbouring Parts, and accompanied with an extraordinary Itching, and dry Pimples. *Blanchard*.

LIE under the Sea : The Sailors say a Ship lies under the Sea, when her Helm being made fast *a-Lee*, she lies to *a-Hull*, that the Sea breaks upon her Bow, or her Broad-side.

LIEGE, is a Word borrowed from the *Feudists*, and hath two several Significations in the Common Law, sometimes being used for *Liege-Lord*, and sometimes for *Liege-Man*. *Liege-Lord*, is he that acknowledgeth no Superior ; *Liege-Man*, is he that oweth Allegiance to his *Liege-Lord*.

LIEN, the same with *Spleen* ; which see.

LIENTERIA, is a kind of Looseness, where the Meat or Aliment taken in, is sent out of the Body before it be altered, or at least before it be digested.

LIFE-RENT, in Law, is a Rent or Exhibition which a Man receives, either for Term of Life, or for Sustentation of Life.

LIFTING-PIECES, are Parts of a Clock which do lift up and unlock the Detents in the Clock-part.

LIFTS, are Ropes in a Ship belonging to the Yard-arms of all Yards : And their Use is to *Top the Yard-arms*, i. e. to make the Ends of the Yards hang higher or lower, as Occasion serves. The *Top-sail Lifts* do serve as *Sheats* for the Top-gallant Yards, as well as for *Lifts* to the Top-sail Yards. The Haling of these Ropes is called *Topping the Lifts* : Thus they say, *Top a Starboard*, or *Top a Port* ; i. e. hale upon the *Starboard* or *Larboard-Lift*.

The *Lifts* for the Sprit-sail Yard, they call *Standing-Lifts*.

LIGAMENTUM : A *Ligament* is a solid and very fibrous Part of an Animal Body, proceeding almost from Matter like a *Cartilage*, different in Size, Number and Situation, broad and round, cold ; as it comes near the Constitution of a Membrane or a *Cartilage*, drier or moister, harder or softer, more or less, tough and flexible. Its Use is to connect the Parts, especially Bones, that they may better perform their Motions. Those which tie the Bones together are wholly insensible, and the others have but a dull Sense.

LIGAMENTUM Ciliare : See *Ciliare Ligamentum*.

LIGEANCY, is such a Duty or Fealty as no Man may owe to more than one Lord ; and therefore it is most commonly used for the Duty and Allegiance which every good Subject owes to his *Liege-Lord* the King.

Ligeantia, says my Lord *Coke*, est duplex, sicut subditus tenetur Regi ad Obedientiam, ita Rex tenetur subdito ad Protectionem : And in another Place, Duplex est Ligamen inter Regem & populum, &c. Vid. 7 Rep. *Calvin's Case*.— Which Passages some will have to be an express Authority in Law, to prove the Original Contract between the King of England and the People.

LIGHT, is used to signify Three Things :

1. That Sensation which arises in us from the View of any Luminous Object, as the Sun, a Star, or a Candle.

2. *Light* signifies the Cause of that Sensation in us, as it is an Action or Property existing in the Luminous Body.

3. By this Word some also understand the Action of the Medium interposed between us and the Luminous Object ; and others, That Train of Rays, which coming forth from thence, pervades the Medium before it can come to affect our Eyes.

Light is undoubtedly produced by Motion, but yet 'tis not every Motion that will produce *Light*. The Learned Dr. H. in his *Micrography*, P. 55. judges the Motion that produces *Light* ought to have these Requisites : 1. That it be exceeding quick, like the Motions of Fermentation and Putrefaction ; (as you see in shining Pickles and rotten Wood.) 2. It must be a Vibrative Motion, and also have its Vibrations exceeding short : This he concludes from the shining of Diamonds, when chafed or rubbed.

As to the Trajection of *Light* through the Medium, the most freely that can be, he well observes,

1. That the Medium must be susceptible and impartible of this Motion. 2. That the Parts of it must be Homogeneous. 3. That their Constitution be such, that *Light* may be propagated through them as soon as possible : Though he asserts, That it can by no Means be Instantaneous ; and seems (so long ago) fully satisfied, That *Light* requires much the same Time for its Trajection, as Mr. *Romer* found it afterwards to do by the Eclipses of *Jupiter's* Satellites : See *Philos. Trans.* N. 136. P. 198.

The Incomparable Sir *Isaac Newton* allows, with other Astronomers, about 10 Minutes of an Hour for the Motion of a Ray of *Light* from the Sun to the Earth. *Princip.* P. 231.

He found also, by plain and repeated Experiments, That the Rays of *Light* being in the Air, and passing near or through the Edges of any opacous or transparent Body, (such as Pieces of Gold or Silver Coin, or square Pieces of those Metals ; the

the Edges of Knives, or of broken Glafs, &c.) are always bent or incurvated towards such Bodies, as if they were attracted by them; and of these, those Rays which pass nearest the Edges, are most incurvated.

And from hence it will follow, That the Refraction of the Rays of *Light*, (especially of those which fall near the Edges of Bodies) is not made just at the Point of Incidence, but a little before the Rays enter into the denser Medium, and a little after they are gotten within it.

The same Person found also by curious Experiments made with *Prisms*, That the vividly coloured Image, transmitted through a Hole, in a darkened Room, opposite to the Sun-beams, and cast on a white Wall, was five times as long as it was broad: This strange Disproportion between the Length and Breadth of the coloured Spectrum put him upon several Thoughts; but at last he thought of this *Experimentum Crucis*: He took two Boards, and placed one close behind the Prism at the Window, so that the *Light* passing through a small Hole purposely made in it, might fall on another Board placed nearer the Wall, at about 12 Foot Distance from the former; and having also a small Hole in it too, for some of the incident *Light* to pass thro'. Behind this Board he placed a second Prism, that the Rays passing through it and the two Holes in the Boards, might be again refracted before it came to the Wall. Then he turned the first Prism at the Window slowly about its Axis, so as to make the several Parts of the Image cast on the second Board successively pass through the Hole in it, that so he might observe to what Places on the Wall the second Prism would refract them. And then he saw plainly, by the Variation of those Places, that the *Light* tending to that End of the Image towards which the Refraction of the first Prism was made, did in the second Prism suffer a Refraction considerably, the *Light* tending to the other End. And so the true Cause of the Length of that Image was detected to be no other, than that *Light* consists of Rays differently refrangible; which, without respect to any Difference in their Incidence, were according to their Degrees of Refrangibility transmitted towards divers Parts of the Wall. From whence he justly concluded, That *Light* it self was an Heterogeneous Mixture of differently Refrangible Rays. *Philosophical Transactions*, N. 80.

He demonstrates also, That since *Light* is always propagated in Right Lines, it cannot possibly consist in Action only, (*Prop. 41, 42. Lib. Princip. Phil. Mathem.*) as the *Cartesians* do assert.

In another Place of the *Transactions* he gives the following Definitions and Propositions.

DEFINITIONS.

1. *Homogeneous, Similar, or Uniform Light*, is that whose Rays are equally refrangible.

2. *Heterogeneous Light*, is that whose Rays are unequally refrangible.

Note, There are but Three Affections of *Light* in which he observed its Rays to differ; viz. *Refrangibility, Reflexibility, and Colour*: And those Rays which agree in *Refrangibility*, agree also in the other two; and therefore may well be defined *Homogeneous*, especially since Men usually call those things *Homogeneous*, which are so in all other Qualities that come under their Knowledge; though in other Qualities their Knowledge extends not to, there may possibly be some *Heterogeneity*.

3. Those Colours he calls *Simple or Homogeneous*, which are exhibited by *Homogeneous Light*.

4. And those Compound or *Heterogeneous*, which are exhibited by *Heterogeneous Light*.

5. Different Colours he calls not only the more eminent Species, Red, Yellow, Green, Blue, Purple, but all other the minutest Gradations; much after the same manner, that not only the more eminent Degree in Musick, but all the least Gradations are esteem'd different Sounds.

PROPOSITIONS.

1. The Sun's *Light* consists of Rays differing by indefinite Degrees of Refrangibility.

2. Rays which differ in Refrangibility, when parted from one another, do proportionably differ in the Colours which they exhibit. These two Propositions are Matter of Fact.

3. There are as many Simple or Homogeneous Colours, as Degrees of Refrangibility; for to every Degree of Refrangibility belongs a different Colour, by *Prop. 2*. And that Colour is Simple, by *Def. 1*, and 3.

4. Whiteness, in all respects like that of the Sun's immediate *Light*, and of the usual Objects of our Senses, cannot be compounded of two simple Colours alone; for such a Composition must be made by Rays that have only two Degrees of Refrangibility, by *Def. 1*, and 3. And therefore it cannot be like that of the Sun's *Light*, by *Prop. 1*. Nor for the same Reason, like that of ordinary White Objects.

5. Whiteness, in all respects like that of the Sun's immediate *Light*, cannot be compounded of Simple Colours, without an indefinite Variety of them: For to such a Composition there are required Rays endowed with all the indefinite Degrees of Refrangibility, by *Prop. 1*. And those infer as many Simple Colours, by *Def. 1*, and 3, and *Prop. 2*, and 3.

6. The Rays of *Light* do not act on one another, in passing through the same Medium.

7. The Rays of *Light* suffer not any Change of their Qualities from Refraction.

8. Nor afterwards from the adjacent quiet Medium. These two Propositions are manifest de facto in *Homogeneous Light*, whose Colour and Refrangibility is not at all changeable, either by Refraction, or by Contamination of the quiet Medium.

And as for *Heterogeneous Light*, it is but an Aggregate of several sorts of *Homogeneous Light*; no one sort of which suffers any more Alteration than if it were alone, because the Rays act not upon one another, by *Prop. 6*. and therefore the Aggregate can suffer none.

9. There can no *Homogeneous Colours* be reduced out of *Light* by Refraction, which are not commixt in it before; because, by *Prop. 7*, and 8. Refraction can change not the Qualities of the Rays, but only separates those which have divers Qualities, by means of their different Refrangibility.

10. The Sun's *Light* is an Aggregate of an indefinite Variety of *Homogeneous Colours*, by *Prop. 1*, 3, and 9. And hence it is, that *Homogeneous Colours* may be called Primitive or Original.

That *Light* is a Body, *M. Molyneux*, in his *Dioptricks*, proves from the various Properties of it; As,

1. By the Affection of its being Refracted, 'tis manifest, that *Light*, in its Passage through this and other Diaphanous Body, does find a different Resistance. Now 'tis unconceivable how any thing but Body should suffer Resistance; but we may conceive

ceive the Resistance that *Light* suffers in its Passage through different Diaphanous Bodies to proceed from the Medium hindering the *Diffusion* or *Distribution* of *Light* through more of the Parts of this Medium, and consequently it may be said to be *less illuminable*: For from the Nature of it, *Light* endeavours to *diffuse* it self: And the contrary, by how much *Light* does more equally or uniformly affect the Parts of the Medium, which it enlightens; or by how much it communicates its *Energy* to more of the *Particles* of the enlightened *Space*, that Medium may be said to be by so much the more *illuminable*, or *less to resist* the Progress of *Light*. Whence it is, that by how much the affected Parts of the Medium are *more solia* and *small*, and admit between them the *less Space* for any other *Heterogeneous* Matter that suffers not by *Light*, by so much the Medium is said to be more enlightened.

And 'tis certain, That *Resistance* must proceed from the *Contact* of two *Bodies*; and *Contact*, either *Active* or *Passive*, belongs only to *Body*.

The Second Property that confirms *Light* to be a *Body*, and a *Body* moved: or thrust forward, is, That it requires *Time* to pass from one Place to another, and does it not in an *Instant*, but is only of all *Motions* the *quickest*: For Mr. *Romer* has demonstrated, beyond all Contradiction, from the Observations of the *Immersions* and *Emersions* of the *Satellites* of *Jupiter*, That *Light* requires the *Time* of one *Second* to move the *Space* of 3000 *Leagues*, or 9000 *Miles*, which is near the *Earth's Diameter*; as may be seen in the *Journal des Savans*, 1676. Decemb. 7. *Philosophical Transactions*, Num. 136. Or Sir *Isaac Newton's Philos. Natur. Math. Lib. 1. Schol. Prop. 96.* where 'tis asserted, That *Light* requires about 10 Minutes *Time* to come from the *Sun* to the *Earth*: And 'tis most evident, without this Allowance for the *Time* spent in *Light's* Motion, the Appearances of the *Satellites*, *Eclipses*, and *Emersions*, are not to be explicated by any *Excentricity*, or other Hypothesis.

A Third Proof that *Light* is a *Body*, is, That it cannot by any Art or Contrivance whatsoever, be *increas'd* or *diminish'd*; that is to say, we cannot magnify (for Instance) the *Light* of the *Sun*, or a *Candle*, no more than we can magnify a Cubick Inch of *Gold*, or make it more than a Cubick Inch: For whenever we see *Light* increased, 'tis by robbing some other Part of the Medium of its *Light*, or by bringing the *Light* that naturally should have been diffused through some other Part, to the more enlightened Place: Thus, for Instance, in a Burning-Glass, by which the *Light* of the *Sun* is highly increased in its *Focus*, or Burning-Point, we are first to consider, That in this *Focus* the Image of the *Sun* is projected, as being the *distinct* Base of the Glass: And Secondly. We may observe all round about this bright Spot of the *Sun's* Image, there is cast the strong Shadow of the whole Breadth of the Burning-Glass: For all the Rays from the *Sun*, that would have fallen on this broad shaded Space, are now brought together, and crowded close in this bright Spot, there raising a vigorous *Light* and violent Heat.

This is abundantly confirmed by an easy Experiment: For cover all the Burning-Glass, except one small round Space in its Middle, just the Bigness of the bright burning Spot in its *Focus*; and though there be a shaded Space round the bright Speck, as before, yet we shall not be sensible of any Increase either of *Light* or Heat; which plainly shews, That this Increase of *Light* (when the Glass is all bare (proceeds from the crowding together of those

Rays that would have fallen on the rest of the Glass, and which (were not the Glass interposed) would have fallen on the shaded Space round about the bright Speck.

There seems but one Objection against what is here laid down; and that is, That *Light* is increased by Reflexion, without depriving any Place of the *Light* it would otherwise receive; or without bringing to the enlightened Part any *Light* that would otherwise escape it, or never come at it. But if we consider the Matter more attentively, we shall find it otherwise: For suppose an Hole of a Foot Square in the Side of a Chamber, and that a Candle were placed close to, and just before the Middle of this Hole; there is but half this Candle that now enlightens this Room, the other half of its Rays proceeding directly out at the Hole: Let now a Looking-Glass be placed so, as just to fill up this Hole; the Rays which before would have gone out at the Hole, are now reflected into the Room; so that the Hemisphere without the Chamber, which was enlightened whilst the Hole continued open, is now robbed of its *Light*; and all this *Light* is now reflected into its Room, whereby the *averse* Side of the Flame is made to enlighten, as well as the Side directly exposed to the Chamber. What is said of this Case, may be accommodated to all: For so a Looking-Glass lying horizontally, and reflecting the Sun-beams to the Ceiling of the Room, does plainly hinder the direct Progress of the Rays to some other Part, and consequently robs that Part of its *Light*. This is evident, by supposing an Hole behind the Glass, as in the former Case.

From whence 'tis manifest, how vainly they attempt, who offer at increasing *Light* uniformly, that is, equally throughout the whole Sphere of a Luminous Body, or Radiating Point: Such are the Pretences of those that would persuade the World of Contrivances for making the small Flame of a Lamp enlighten strongly a whole Chappel, Hall, or Court, by being hung up in the midst thereof: For these things are impossible to be effected in Nature, and they had as well pretend to create *Light*; for there is no other way of increasing it, unless by robbing another Place of its *Light*, and then 'tis not uniformly increased. We have a very sensible Instance of this in the new-invented Lanthorns, now much used in London, which, by the Convex-Glasses in their Sides, do strongly throw those Rays along the Walks of the Passengers, which, would otherwise (were the Glasses away, and the round Holes left open) be spent on Parts of the Streets not frequented; whereby the untrodden Parts of the Streets are robbed of their *Light*, more strongly to supply and enlighten the Paths where the *Light* is requisite.

The Intenfness of *Light* (as also of Heat) is always proportionable to the Density of the Rays that produce it: And that Density always is in all Places, or at all Distances from the Center of Radiation, as the Squares of such Distances reciprocally: See *Quality*.

In the French Memoirs of the Royal Academy of Sciences, there is an Account of a New Theory of *Light*, which is started by M. *Malebranche*: He thinks *Light* and Colours do arise from Vibrations of the insensible Parts of Bodies, as Sounds do: And therefore, according to the Degree of the Rapidity of the Motion of the Parts of a Luminous Body, it will appear enlightened more or less; and in lesser Degrees of such vibrating Motion, it will appear not Luminous, but of such and such Colours: see Vol. II.

LIKE *Quantities*, in *Algebra*, are such as are expressed by the same Letters equally repeated in each Quantity. Thus $2b$ and $3b$, and $9ff$ and $3ff$, are like *Quantities*; but $2b$ and $3bb$, and $9ff$ and $3fff$, are unlike ones; because the Quantities have not every where the same Dimensions; nor are the Letters equally repeated.

LIKE *Signs*, in *Algebra*, are when both are Affirmative, or both Negative; but if one be Affirmative, and the other Negative, they are unlike *Signs*. Thus $+64d$ and $+5d$ have like *Signs*; but $9ff$ and $-7ff$ have unlike *Signs*.

LIKE *Figures*, in *Geometry*, are such as have their Angles equal, and the Sides about these equal Angles proportional.

LIKE *Arks*, in the Projection of the Sphere in *Plano*, are Parts of Lesser Circles, containing an equal Number of Degrees with the corresponding Arks of Greater ones.

LIKE *Solid Figures*, in *Geometry*, are such as are contained under like Planes, equal in Number.

LIMBER *Holes*, in a Ship, are little square Holes cut in the Bottom of all her Ground-timber and Hooks, about 3 or 4 Inches square: Their Use is to let the Water to the Well of the Pump, which else would rest between those Timbers where the Keel-Rode runs.

LIMB, signifies the outermost Border or graduated Edge of an *Astrolabe*, or the like Mathematical Instrument; or the Circumference of the primitive Circle in any Projection of the Sphere in *Plano*: Also the outermost Border of the Sun's or Moon's Disk in an Eclipse of either Luminary.

LIMIT of a Planet, is the greatest Heliocentrick Latitude; which see.

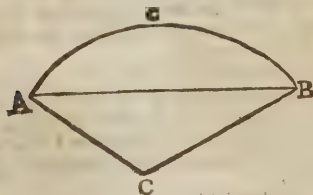
LIMITATION of *Affize*, is a certain Time set down by Statute, wherein a Man must alledge himself, or his Ancestor, to have been seized of Lands, sued for by a Writ of *Affize*.

LIMITED *Problem*, (for so I translate Mr. Ozanam's Word *Ordonne*) signifies a Problem that hath but one only Solution, or which can be done but one only way; as to make a Circle pass thro' 3 Points given, not lying in a Right Line; to describe an Equilateral Triangle on a Line given.

LINCH *Pins*, are those Pins that keep on the Trucks or Wheels on the Carriage of a Piece of Ordnance.

LINCTUS, the same with *Eclegma*; which see.

LINE: A Line in *Geometry*, is a Quantity extended in Length only, and is supposed to have no Breadth or Thickness. It is made by the Motion of a Point; as, if the Point *A* be moved towards *B*,



it will by its Motion trace out or describe a Line; which, if it go the nearest way between *A* and *B*, will be a Right or Straight Line, whose Definition therefore will be the nearest or shortest Distance between any two Points. But if the Point go any way about, as in any of the Lines *ACB*, then it will trace out either a Crooked Line, as the upper *ACB*; or else two or more Straight ones, as in the lower *ACB*.

From which Genesis or Production of a Line, several Consequences will fairly follow; some of which are needless Propositions in *Euclid*.

1. Two Right Lines cannot include a Space; but if drawn from the same Point to the same Point, will always be coincident; and drawn any how else, can only meet and make an Angle, but can never bound or terminate a Space. *Axiom*. 14. 1 *Euclid*.

2. In any Triangle, as *ACB*, any two sides, as *AC* and *CB* taken together, are longer than the third *AB*; because *AB* is the shortest Distance between the two Points *A* and *B*. 20. 1 *Euclid*.

3. A Tangent (or Line touching the Circumference of a Circle) can touch it but in one Point; and consequently will be all of it without the Circle. 16. 3. *Euclid*.

4. A Right Line drawn between any two Points in the Circumference of a Circle, falls all within the Circle. 2. 3. *Euclid*.

LINE of Measures, so Mr. Oughtred calls the Diameter of the primitive Circle in the Projection of the Sphere in *Plano*; or that Line in which the Diameter of any Circle to be projected falls.

LINE of Numbers, is a Line so called by its Inventor Mr. Gunter, and therefore frequently called Gunter's Line. This is usually placed on a Ruler, or the Back of a Sector; and running parallel with it, you have the Artificial Lines, as we usually call them.

LINES and their Properties; see Vol. II.

The Second Book of *Euclid* treats mostly of Lines, and of the Effects of their being divided, and then multiplied into one another; as also do the first Six Propositions of Book the 13th. The former of which you have here very briefly demonstrated Algebraically.

1. If there be two Lines z and x ; one of which, as z , is divided into any Number of Parts, as into $a + c + i + o$, the Rectangle under the two whole Lines zx , is equal to the Sum of all the Rectangles made by x multiplied into the Parts of z .

$$\begin{array}{c} z | \frac{a}{\quad} | \frac{c}{\quad} | \frac{i}{\quad} | \frac{o}{\quad} | \\ x | \frac{a}{\quad} | \frac{c}{\quad} | \frac{i}{\quad} | \frac{o}{\quad} | \end{array}$$

That is $zx = xa + xc + xi + xo$. This is to plain, it needs no Proof.

2. If a Right Line, as z , be divided into two Parts $a + c$, the Rectangles made by the whole Line, and both its Parts are equal to the Square of the whole Line: see Fig. 2.

That is, $za + zc = zz$.

For $za = aa + ac$.

And $zc = ac + cc$.

Therefore $zz = aa + zc + cc$. Q. E. D.

3. Let the Line z be cut into $a + c$; then shall the Rectangle under the whole Line (z) and the Part (a) be equal to the Square of that Part a , together with the Rectangle made by the two Parts a and c .

That is, $za = aa + ac$.

$$z \frac{a}{\quad} \frac{c}{\quad}$$

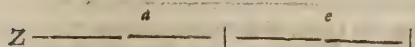
For $z = a + c$

And $a + c \times a = aa + ac$. Q. E. D.

4. The Square of any Line, as z , divided into any two Parts a and c , is equal to both the Squares of those Parts together, with the Rectangles made out of those Parts.

That is, $zz = aa + 2ac + cc$.

z ———



Multiply $a + e$ by it self, and the Thing is plain.

$$\begin{array}{r} a + e \\ a + e \\ \hline aa + ee \\ + ae + ee \\ \hline aa + 2ae + ee \end{array}$$

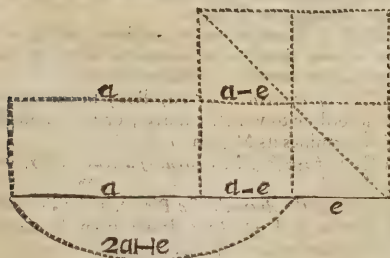
COROLLARIES.

Hence 'tis plain, that the Square of any Line is equal to four times the Square of its half. For suppose Z to be bisected, then each Part will be a ; and multiplying $a + a$ by it self, the thing will plainly appear.

A horizontal line labeled Z at the left end. It is divided into two equal segments, each labeled 'a'.

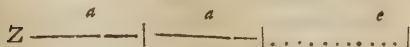
$$\begin{array}{r} a + a \\ a + a \\ \hline aa + aa + aa + aa = 4aa \end{array}$$

5. If a Line be divided into two Parts equally, and into two other Parts unequally, the Rectangle under the unequal Parts, together with the Square of the intermediate Part, the Difference between the equal and unequal Parts, is equal to the Square of half that Line.



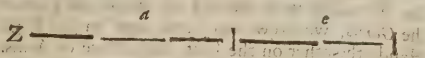
Let the whole Line be $2a$, then each Part will be a ; let the lesser unequal Part be e , then the greater unequal Part will be $2a - e$; which multiplied by e , produces $2ae - ee$: To which adding the Square of the Difference, or intermediate Part $a - e$, which is $aa - 2ae + ee$, the Sum will be only aa , the Square of half the Line.

6. If a Line be bisected, and then another Right Line be added to it, the Rectangle or Product of the whole augmented Line multiplied by the Part added, together with the Square of the half Line, is equal to the Square of the half Line, and part added, as one Line.



Let the first Line be $2a$, and the Part added e , then the whole will be $2a + e$; which multiplied by e , produces $2ae + ee$, and the Square of half the Line a being added to it, it will be $2ae + e + aa$, which is equal to the Square of $a + e$, by Prop. 4.

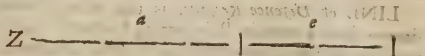
7. If a Quantity or Line be divided any how into two Parts, the Square of the whole added to the Square of one of the Parts, shall be equal to two Rectangles contained under the whole Line and that Part, added to the Square of the other Part.



Let a be one Part, and e the other; the Square of the whole, and if the lesser Part e , makes $aa + 2ae + 2ee$. Then if the whole $a + e$ be multiplied twice by e , it will produce $2ae + 2ee$; and if to this be added the Square of the other Part aa , the Sum will be

$$aa + 2ae + 2ee, \text{ equal to the former.}$$

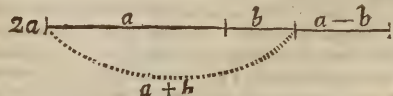
8. If a Line cut any how into two Parts, the Quadruple Rectangle under the whole Line and one of the Parts, added to the Square of the other Part, is equal to the Square of the whole, and the other Part added to it, as if it were but one Line.



Let the whole Line be $a + e$, then four times that multiplied by e (or the Quadruple Rectangle under that and e) will be $4ae + 4ee$; to which adding the Square of the other Part aa , the Sum will be $aa + 4ae + 4ee$.

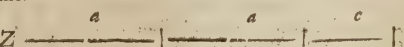
And if you square $a + e$, which expresses the whole Line, with e added to it, the Product will be the former Sum of $aa + 4ae + 4ee$.

9. If a Line be bisected, and also cut into two other unequal Parts, the Sum of the Squares of the unequal Parts will be double to the Sum of the Squares of the half Line, and of the Difference between the two unequal Parts.



Let the whole Line be $2a$, and the Difference between the equal and unequal Parts b ; then the greater unequal Part will be $a + b$, and the lesser $a - b$: The Sum of the Squares of the unequal Parts will be $2aa + 2bb$, which is double to the Square of half the Line added to the Square of the Difference, Q. E. D.

10. If a Line be bisected, and then another Line added to it; the Square of the whole increased Line, together with the Square of the Part added, is double the Sum of the Squares of the half Line, and of the half Line and Part added, taken as one Line.



Let the whole Line be $2a$, and the Part added e ; then the whole increased Line will be $2a + e$; and the half Line and Part added, will be $a + e$. The Sum of the Squares of $2a + e$, and of e , is $4aa + 4ae + 2ee$; which is plainly double to aa , and $aa + 2ae - ee$ added together. Q. E. D.

LINE, in Fortification, is that which is drawn from one Point to another, in delineating a Plane upon

upon Paper. But in the Field it is sometimes taken for a Ditch bordered with its Parapet, and sometimes for a Row of *Gabions*, or Sacks of Earth, extended in Length on the Ground, to serve as a shelter against the Enemies Fire. Thus they say, when the Trenches were carried on within 30 Paces of the *Glacis*, we drew two Lines, one on the Right Hand, the other on the Left, for a Place of Arms.

LINE Capital, is that which is drawn from the Angle of the Gorge to the Angle of the Bastion.

LINE Cogitrel, is that which is drawn from the Angle of the Center to that of the Bastion.

LINE of Defence, is that which represents the Course of the Bullet of any sort of Fire-Arms, more especially of a Musquet-Ball, according to the Situation which it ought to have to defend the Face of the Bastion.

LINE of Defence Fix'd or Fichant, is that which is drawn from the Angle of the Curtain to the flank'd Angle of the opposite Bastions; nevertheless without touching the Face of the Bastion. This must never exceed 800 Feet, which they reckon the Distance a Musquet-Ball will do Execution.

LINE of Defence Razant, is that which being drawn from a certain Point of its Curtain, Raseth the Face of the opposite Bastion. This is called also the Line of Defence Stringent or Flanking.

LINE of Approach, or of Attack, signifies the Work which the Besiegers carry on under Cover, to gain the Moat, and the Body of the Place.

LINE of Circumvallation, is a Line or Trench cut by the Besiegers within Cannon shot of the place, which rangeth round their Camp, and secures its Quarters against the Relief of the Besieged.

LINE of Contravallation, is a Ditch border'd with a Parapet, which serves to cover the Besiegers on the side of the place, and to stop the Sallies of the Garrison.

LINES within side, are the Moats towards the place, to prevent the like Sallies.

LINES without side, are the Moats towards the Field, to hinder Relief.

LINES of Communication, are those that run from one Work to another. But the Line of Communication, more especially so called, is a continued Trench with which a Circumvallation or Contravallation is surrounded, and which maintains a Communication with all its Forts, Redoubts, and Tenables.

LINE of the Base, is a Right Line which joins the points of the two nearest Bastions.

To **LINE a Work**, is to strengthen a Rampart with a firm Wall, or to encompass a Parapet or Moat with good Turf, &c.

LINEA Apfidum, or the Line of the Apfes, in the Old Astronomy, is a Line passing through the Center of the World, and the Center of the Excentrick; and whose two Ends are, one the *Apogee*, the other the *Perigee* of the Planet. That part of this Line which lies between the Center of the World and that of the Excentrick, is called the *Excentricity*.

LINE of Greatest or Least Longitude of a Planet, is that part of the *Linea Apfidum* reaching from the Center of the World to the *Apogee* or *Perigee* of the Planet. But the

LINE of Mean Longitude, is one drawn through the Center of the World at Right Angles to the *Linea Apfidum*, and is there a new Diameter of the Excentrick or Deferent; and its Extreame Points are called the *Mean Longitudes*.

LINE of the mean Motion of the Sun, in the Old Astronomy, is a Right Line drawn from the Center of the World as far as to the Zodiack of the *Primum Mobile*, and parallel to a Right Line drawn

from the Center of the Excentrick to the Center of the Sun; Which latter Line they call also the

LINE of the mean Motion of the Sun in the Excentrick, to distinguish it from the former; which is the Line of mean Motion in the Zodiack of the *Primum Mobile*.

LINE of the Sun's True Motion, is a Line drawn from the Center of the World to the Center of the Sun, and produced as far as the Zodiack of the *Primum Mobile*.

LINE Horizontal, is a Right Line parallel to the Horizon.

—In **Dialling**, it is the common Section of the Horizon and the Dial-Plane.

—In **Perspective**, it is the common Section of the Horizontal Plane, and that of the Draught or Representation, and which passes through the principal Point.

LINE Geometrical, in Perspective, is a Right Line drawn any how on the Geometrical Plane.

LINE Terrestrial, in Perspective, is a Right Line, wherein the Geometrical Plane, and that of the Picture or Draught intersect one another.

LINE of the Front, in Perspective, is any Right Line parallel to the Terrestrial Line.

LINE Vertical, in Perspective, is the common Section of the Vertical and of the Draught.

LINE of Station, in Perspective, according to some Writers, in the common Section of the Vertical and Geometrical Planes. Others, as *Lamy*, mean by it the perpendicular Height of the Eye above the Geometrical Plane. Others, a Line drawn on that Plane, and perpendicular to the Line, expressing the Height of the Eye.

LINE Objective, in Perspective, is the Line of an Object, from whence the Appearance is sought for in the Draught or Picture.

LINE of Gravitation, of any heavy Body, is a Line drawn through its Center of Gravity, and according to which it tends downwards.

LINE of Direction, of any Body in Motion, is that according to which it moves, or which directs and determines its Motion.

LINE of the swiftest Descent of a heavy Body: See the *Cycloid*.

LINE of the Anomaly of a Planet, in the Ptolemaick System, a Right Line drawn from the Center of the Excentrick to the Center of the Planet.

LINE of the Apogee of a Planet, in the Old Astronomy, is a Right Line drawn from the Center of the World, through the point of the *Apogee*, as far as the Zodiack of the *Primum Mobile*.

LINE of the Nodes of a Planet, in the New Astronomy, is a Right Line from the Planet to the Sun, being the common Intersection of the Plane of the Planets Orbit with that of the Ecliptick.

LINE Synodical, in reference to some Theories of the Moon, is a Right Line supposed to be drawn through the Centers of the Earth and Sun: And if it be produced quite thro' the Orbits, 'tis called the

LINE of the True Syzygies. But a Right Line imagined to pass through the Earth's Center, and the mean Place of the Sun is called the

LINE of the Mean Syzygies.

LINE Horary, or the *Hour-lines*, in Dialling, are the common Intersections of the Hour-Circles of the Sphere, with the Plane of the Dial.

LINE Subsylar, is that Line on which the Style or Cock of the Dial is Erected, and is the Representation of such an Hour-Circle as is perpendicular to the Plane of that Dial.

LINE Equinoctial, in Dialling, is the common Intersection of the Equinoctial, and the Plane of the Dial.

L I N E S

LINES, in the Art of War, signify the Position of an Army ranged in Order of Battel, extending themselves to such a length, or as far as the Ground will allow, to prevent flanking. Armies do usually place themselves in three Lines: The first of which is the *Van*, or *Advanc'd Guards*; the second the *Main Body*; the third the *Rear-Guard*, or *Reserve*. There is left the Distance of about 150 Paces between the two first Lines, and about double that Distance between the second and last. To

LINE Hedges, is to plant Musqueteers all along them under their Covert, to fire upon an Enemy that comes open, or for a Defence against Horse.

LINEA Alba, is a Concourse of the Tendons of the Muscles of the *Abdomen*, excepting the Tendons of the straight ones; for the Tendons of the oblique Muscles unite, and meet so on both Sides, that they make a kind of Tunick that covers the *Abdomen*, as if they were all but one Tendon. It is white, and not fleshy, proceeding from the *Cartilago Eniformis* to the *Os Pubis*; and is narrower below the Navel than above.

LINEAR Problem, in Mathematicks, is such an one as can be solved Geometrically by the Interfection of two Right Lines; as to measure an inaccessible Height by the means of two unequal Sticks or Staves. This is also called a *simple Problem*, and is capable but of one Solution.

LINEAR Numbers, are such as have relation to Length only; as (*v. gr.*) such as represent one side of a plane Figure: And if the plane Figure be a Square, the *Linear Number* is called a *Root*.

LINEs of Chords, Sines, Tangents, Secants, Versed Sines, &c. See *Scale*.

LINED Moat, a Term in Fortification: See *Moat*.

LINGOT, the Term in Chymistry for the *Molds* they make to cast melted Metals, or the *Regulus* of *Antimony*, &c. into.

LINGUA, the Tongue, is an oblong, broad, thick Member, and thicker at the Root, and thinner and sharper at the End; of a moderate Bigness, that it may move more quickly. In the exterior or upper Part of the Tongue there are a great many little Bodies, which break out from the Surface of the Tongue, and bending a little, incline backwards towards the Root, so that they look like a Comb to card Wool. These Cartilaginous Bodies, in an Ox especially, seem to resemble the Figure of a Boar's Tooth. In the lower Part they have a certain Cavity. They are made of a thick tenacious fibrous Matter, which seems like a Heap of little Rods: About the Sides of the Tongue they grow smaller and smaller, so that they almost disappear; and certain Membranous Bodies are placed at their Basis, which appear at first of a Conical Figure, and then by and by of a more obtuse one, and of a pappy Substance. All the little Protuberances are clothed with the Membranes of the Tongue: They are firmly implanted in a certain tenacious Tunick of the Tongue, there being under them a crass, viscous or nervous Substance, especially in those Places where there are remarkable Pits in the Tongue disposed in like Order and Manner; so that in the inner Part of the Tongue there are a great many of them, which are firmly implanted in a kind of viscous Body. When the Membrane that covers the whole Tongue is taken off, there appears a certain Glutinous Substance; then a Nervous Pappy Body, something Yellow, which spreads like the Membrane, and discovers several remarkable

Nervous Protuberances, dispos'd and order'd in a wonderful Order. The next Things that appear are like Nipples, in greater abundance than those before-mentioned, and of another Order; for as many little Protuberances as cover the Outside of the Tongue, so many Nervous Nipples of this sort are found within. These proceed from the common pappy Substance, grow tolerably high, and shoot out further into Nervous Sprouts from the Top of them; about which you discover innumerable little Protuberances proceeding from the Stock, and of an equal Height, only slenderer, like a Cone, and which go within their proper Cavities, ready made in the crass viscous Substance before-mentioned, and at last end toward the outermost Membrane. Furthermore, the Substance of the Tongue is Muscliculous: The Central Parts of the Tongue consist of several sorts of Fibres, long, transverse and oblique, which being mutually interwoven with one another, look like a Coverlid or Blanket. It owes its Motion to peculiar Muscles of its own, where-with it is contracted and abbreviated. The Pairs of Muscles are the *Syloglossum*, *Basioglossum*, *Genioglossum*, *Ceratoglossum* and *Myloglossum*; which see. *Blanchard*.

LINGUALIS, is taken by some to be a large and fleshy Muscle arising from the Basis of the *Os Hyoides*, and runs forward to the Tip of the Tongue; and *Spigelius* gives it this Use, That its transverse Fibres do thicken, and as it were constrict the Tongue, and dilate it by its oblique Fibres, and bring it towards the Palate by its right Fibres: But it is disputable whether it be a Muscle or not.

LINTER: See *Scapha*.

LINUM Vivum: See *Asbestine Cloth*.

LIONCELES, the Herald's Term for *Lions*, when there is more than two of them born in any Coat of Arms, and no Ordinary between them; and 'tis all one as a small or young Lion.

LIPOTHYMIA, or *Liposchia*, is a swooning or fainting away, being an imperfect *Syncope*; which see.

LIQUIDS, are such Bodies as have all the Properties of *Fluidity* (see that Word); and withal, have their Particles so formed, figured or disposed, that they do adhere to the Surfaces of such Bodies as are immersed in them, which we call *wetting*: And this Property of Liquid Bodies is sometimes called *Humidity* or *Moisture*.

LIQUOR of Fix'd Nitre: See *Fix'd Nitre*.

LIST, in Architecture, is a straight upright Ring, which runs round the lower Part of any of the Columns just above the *Tore*, and next to the Shaft or Body of the Pillar.

LISTEL, a small Band, or a kind of a Rule in the Mouldings of Architecture: Also the Space between the Channellings of Pillars.

LITERAL Algebra: See *Algebra*.

LITHARGE, what, and how made, see *Purification of Silver*.

LITHIASIS, the Breeding of the Stone in the Kidneys or Bladder.

LITHONTRIPTICKS, are Medicines which break the Stone, either in the Bladder or the Kidneys.

LITHOTOMIA, is the Grand Operation of cutting the Stone out of the Bladder; and is thus described by *Blanchard*. The Operator lays the sick Person upon a soft Pillow, in the Bosom or Lap of some strong Man, after he has leapt three or four times from on high, then he ties the Hands on

each side fast to the Sole of the Foot, and two People standing on each side hold the Knees as open as possible. After this, the Operator moistening one Finger of his Left-Hand, or if Necessity require the two foremost, with Oyl of White Roses, thrusts them up into the Fundament, and with his Right-Hand presses the Upper Parts of the Secrets lightly, that by this means the Stone may be brought to the *Perineum*; which when he has forced thither, with his Fingers, he cuts with a two-edged Knife, proportionably to the Bigness of the Stone, in the Left Side, betwixt the Testicles and the Fundament, near to the Suture of the *Perineum*, bringing the Stone towards the Knife: And if the Stone come not out, either of its own Accord, or by thrusting of the Fingers, he draws it out with the *Forceps*; i. e. a pair of Pincers, or some such Instrument of Art. The Stone being drawn out, and all the Bands being loosed, he closes the Wound duly, applies Remedies, stops the Blood, and takes Care that the Wound be closed up, lest the Urine should continually drop through. This Way is called *Apparatus minor*, and is used especially in Boys, though it be frequently practised too in Adult Persons in these Countries. This we in England call *Cutting upon the Gripe*, and is the Method that our *Suters* always cut by: But in the *Apparatus major*, or the greater Operation, which we call *Cutting upon the Staff*, the Patient, bound as before, is set upon a Table, and held there; then the Chyrurgeon thrusts in his Instrument, called *Itinerarium*, by the Urinary Passage into the Bladder, as far as the very Stone; and cutting an Hole, as before, he puts another Instrument called *Conductor*, into the hollow Part of the *Itinerarium*, through the Wound; then the *Itinerarium* being taken out of the Urinary Passage, he puts in the Instrument called *Forceps* (a sort of Pincers) or any other fit to pull out the Stone through the Wound before made, that he may lay hold of the Stone, and bring it out: This being done, the Wound is bound up, and consolidated, as 'tis in Children; only if it be large, it is stitched up, and an Instrument of Silver applied to it for Two or Three Days, which is useful to let out concremented Blood, Phlegm, and Gravelly Urine. There is yet another Way of taking out the Stone, to wit, By making a Hole in the *Abdomen*, by which the Stone is taken out of the Bottom of the Bladder; and in this way no dribbling of Urine need to be feared. *Blanchard*.

LITHOTOMIST, is a Chyrurgeon who is skilful in cutting out the Stone of the Bladder.

LITOTES, or *Diminutio*, is a Trope in Rhetorick, by which we speak less than we think: As when we say, *I cannot commend you*; it implies a secret Reprehension for something committed that hinders us.

LITTORAL Shells, are with the Writers of Natural History, such Sea-shells as are always found near the Shores, and never far off in the Deep: But such as are found there in the Bottom of the Sea, remote from the Shore, they call *Epeiridior* and *Pelagie*.

LIVER of Antimony: See *Crocus Metallorum*.

LIVERY hath Three Significations: In one it is used for a Suit of Cloth or Stuff that a Gentleman giveth in Coats, Cloaks, Hats, or Gowns, with Cognisance, or without, to his Servants or Followers. In the other, it signifies a Delivery

of Possession to those Tenants which held of the King in *Capite*, or Knight's Service; for the King, by his Prerogative, hath *primier Seisin* of all Lands and Tenements to holden of him. In the Third Signification, *Livery* is the Writ which lies for the Heir to obtain the Possession of Seisin of his Land at the King's Hands.

LIVERY of Seisin, is a Delivery of Possession of Lands or Tenements, or rather Things Corporeal, unto one that hath Right, or a Probability of Right to them. This is a Ceremony in the Common Law, used in Conveyance of Lands or Tenements, &c. where an Estate in Fee-simple, Fee-tail, or a Free-hold, shall pass; and is a Testimonial of the willing departing of him who makes the *Livery*, from the Thing whereof *Livery* is made; and the Receiving of the *Livery* is a willing Acceptance of the other Party. And it was invented, that the Common People might have Knowledge of the Passing or Alteration of Estates from Man to Man, that thereby they might be the better able to try in whom the Right of Possession of Lands and Tenements were, if they should be impannelled in Juries, or otherwise have to do concerning the same. Of this *Livery* there be two kinds, viz. a *Livery in Deed*, and a *Livery in Law*: A *Livery in Deed*, is when the Feoffor taketh the Ring of the Door, or Turf or Twig of the Land, and delivereth the same to the Feoffee in the Name of the *Seisin* of the Land. A *Livery in Law*, is when the Feoffor saith to the Feoffee, being in View of the House or Land, *I give to you yonder Land, to you and your Heirs; and therefore enter into the same, and take Possession thereof accordingly*: And the Feoffee doth accordingly, in the Life of the Feoffor, enter: This is a good Feoffment.

LIVIDUS: See *Pectineus*.

LIXIVIOUS, or *Lixivate Salts*, are the fix'd Salts of Plants, &c. They are drawn by *Calcination* of the Plant, and then making a Lye or Lixivium of the Ashes and Water; whence this Name. See *Salts*.

Mr. Boyle saith, The distinguishing Mark of *Lixivious Salts*, whereby they differ from Urinous ones, is, That they will turn a Solution of Sublimate in Common Water, into a Yellow Colour: See *Experiments on Colours*.

LIZIERE, a Term in Fortification; the same with *Berne*; which see.

LOADSTONE: See *Magnet*.

LOBE, a Word used mostly by Anatomists for the Division of the Lungs into several Parts, which they call *Lobes*: And by Botanists, for the Division or Parts of the Bulk of Seeds, which usually consist of two Parts or Lobes; as is very conspicuous in Beans.

LOBUS Auris, is the lower Part or Tip of the Ear.

LOCAL, is whatever is supposed to be tied or annexed to any particular Place: Thus in Law, they say the Thing is *Local*, and annexed to the Free-hold.

And an Action of Trespas for Battery, &c. is *Transitory*, not *Local*; that is, it is not needful that the Place where the Battery was committed, should be set down as material in the Declaration; or if it be set down, the Defendant cannot traverse it, by saying he did not commit the Battery in the Place mentioned in the Declaration, and so avoid the Action.

LOCAL

LOCAL Medicaments, are those which are applied outwardly, as Plasters, Ointments, Salves, &c. These are also frequently called *Topicks*.

LOCAL Problem, in Mathematicks, is such an one as is capable of an infinite Number of different Solutions: so that the Point which is to resolve the Problem, may be indifferently taken within a certain Extent; as suppose any where in such a Line, within such a Plane Figure, &c. which is called a *Geometrick Place*, and the Problem is said to be a *Local* or *Indetermined* one. And this *Local Problem* may be either *Simple*, when the Point sought is in a Right Line; *Plane*, when the Point sought is in the Circumference of a Circle; *Solid*, when the Point required is in the Circumference of a Conick Section; or, lastly, *Surfsolid*, when the Point is in the Perimeter of a Line of the *second Gender*, as the Geometers call it.

LOCH, or *Loboch*, the same with *Elegma*.

LOCHIA, are the Natural Evacuations of Women in Child-bed, after the Birth of the *Fœtus*, and the Exclusion of the Membranes call'd *Secundina*, or the After-birth.

LOCKER, in a Ship, is a kind of Box or Chest made along the side of a Ship, to put or stow any thing in.

LOCKING-WHEEL, see *Count-Wheel*, a Term in Watch-work.

LOCK-SPIT, a Term in Fortification, signifying the small Cut or Trench made with a Spade, to mark out the first Lines of any Work that is to be made.

LOCULAMENTUM, in Botanicks, is a little distinct Cell or Partition within the common *Capsula seminalis* of any Plant; as those within the Seeds of Poppies, &c. by which one Parcel of the Seeds is kept distinct from another.

LOCUS, or the Place of any Body, is rightly, by Mr. *Newton*, distinguished into *Absolute* and *Relative*: And so ought *Space* to be accounted; for the

LOCUS Absolutus, or *Primarius* of any Body, is that Part of the absolute and immovable Space, or extended Capacity, to receive all Bodies which this individual one takes up: But the

LOCUS Relativus, or *Secundarius*, is that apparent and sensible Place in which a Body is determined to be placed in by our selves, and with relation to other adjoining or contiguous Bodies.

LOCUS Appareus, a Term in Opticks: See *Apparent Place of any Object*. 'Tis also in Astronomy, that Place in which any Planet or Star appears, when viewed from an Eye at the sensible Horizon.

LOCUSTÆ, are the Beards and pendulous Seeds of Oats, and of the *Gramina paniculata*; to which the Botanists gave this Name from their Figure, which something resembles that of a Locust.

LODGMET, in Military Affairs, is sometimes an Incampment made by an Army; or oftner, it is a Retrenchment dug for a Covert or Shelter, when the Counterscarp, or some other Post, is gain'd. It is also taken for the Place where the Soldiers quarter among the Burghers, either in Huts, Baraques, or Tents.

LODGMET of an Attack, is a Work cast up by the Besiegers, during their Approaches in a dangerous Post, where it is absolutely necessary to secure themselves against the Enemy's Fire; as in a *Covert-way*, in a *Breach*, in the Bottom of the Moat, or elsewhere. This Lodgment consists of all the

Materials that are capable to make Resistance, viz: *Barrels and Gabions* of Earth, *Pallisadoes*, *Woolpacks*, *Mantelets*, *Faggots*, &c.

LOG, and *Log-line*: The *Log* aboard a Ship, is a Piece of Board or Wood about 7 or 8 Inches long; of a Triangular Figure, and with as much Lead cast into it at one End, as will serve to make it swim upright in the Water; at the other End of which is fasten'd a small long Line, called The

LOG-LINE; which is wound about a Reel for that Purpose, fix'd in the Gallery of the Ship. This Line, for about 10 Fathom from the Log, hath, or ought to have, no Knots or Divisions; because so much should be allowed for the Log's being clear out of the Eddy of the Ship's Wake before they turn up the Glass: But then the Knots or Divisions begin; and ought to be at least 50 Foot from one another; tho' the common erroneous Practice at Sea, is to have them but at 7 Fathom, or 42 Foot Distance.

The Use of this *Log* and *Line* is to keep an Account, and make an Estimate of the Ship's Way; for as many Knots as run out in half a Minute of Time (which they measure by a Half-minute Glass) so many Miles do they account the Ship to sail in an Hour; or so many Leagues and Miles doth she run in a Watch: as, if there be veered out 4 Knots in half a Minute, the Ship runs 4 Miles an Hour, or 5 Leagues and 1 Mile in a Watch.

The Practice of heaving the *Log*, is first to let it down into the Water, and then to let it run away so far, as to be out of the Eddy of the Ship's Wake; and then one having an Half-minute Glass in his Hand, turns it up just when the first Knot runs off the Reel (tho' some turn up the Glass just when the Log touches the Water) and then the Line running easily off, when the Glass is out, he cries, *Stop!* The other stops the Reel; and then they count the Knots run out, and if they can be so exact, as to account the odd Feet, which the Line shall run out above any Knot, they ought to account 5 Feet for a Tenth part of a Mile more: And thus, if 3 Knots 45 Feet run out in an half Minute, the Ship goes at the rate of 3 Miles 9 Tenths in an Hour.

Now tho' this at best be but a precarious way, 'tis however the most exact of any in use, and much better than that of the *Spaniards* and *Portuguese*, who guess at the Ship's Way by the running of the Froth or Water by the Ship's side; or than that of the *Dutch*, who use to heave over a Chip into the Sea, and so to number how many Paces they can walk on the Deck, while the Chip swims or passes between any two Marks or Bolt-heads on the side. And the Ground and Reason of this Practice of keeping an Account of a Ship's sailing by the *Log*, is this:

1. That 5 of our *English* Feet make a Pace, and 1000 of such Paces a Mile, and 60 of such Miles a Degree, and consequently a Degree would contain 300000 Feet. But this is erroneous on all Accounts; for there are both 1006 Paces in a Mile, and 72 such Miles in a Degree.

2. But then this hath been corrected by Mr. *Norwood*, in his *Seaman's Practice*; who, by most exactly measuring the Distance of two Places under the same Meridian, and finding also the Latitudes of those two Places by most accurate Instruments and Observations, he found, That to a Degree of a Great Circle on the Earth there must be 367200 *English* Feet: And this hath been in a good measure confirmed by the *French* Observations and Measurements, who found a Degree to contain 365184 Feet. And yet Mr. *Norwood* considering that the Ships

Ship's Way is really more than what is found by the Log, and also knowing that 'tis better and safer to have the Reckoning to be something before the Ship, and probably also because 'tis a round Number; cast away the 7200 odd Feet, and suppose a Degree to contain just 360000 Feet. Then will a Minute of a Degree contain 6000 such Feet; and that is to be reckoned for the true *Sea Mile*, 60 of which make a Degree: And since 5280 Feet are a Statute Mile, there will be 68 $\frac{1}{3}$ such Miles in a Degree; and of the *Italian Miles*, of 5000 Feet, 72, or 24 Leagues in a Degree. And after this way of accounting, the whole Circumference of our Globe will be 8640 Leagues, or 25920 Miles; which is 120 Leagues, or 360 Miles less than the *French* make it: And yet this is probably less than the Truth, and in Fact less than Mr. *Norwood's* Account.

Now to apply all this to the Estimation of a Ship's Way by the Log: If it be considered that an half Minute is the 120th part of an Hour, 'tis plain the Distance between Knot and Knot in the *Log-line*, must be also the 120th part of a Minute of a Degree of a great Circle on the Earth; or 120th part of a true Sea Mile or Minute, which is before shewed to contain 6000 Feet: And therefore the Distance between the Knots must be 50 Foot; (for 50 multiplied by 120, produces 6000) because as 30 Seconds is to an Hour, or 3600 Seconds is to a Day; so is 50 Feet to 6000 Feet. Wherefore as many times 50 Feet as a Ship sails in half a Minute, so many Miles must she go in an Hour, supposing her to keep on at the same Rate. To try which, in long Voyages to the *East-Indies*, &c. the Log is heaved every Hour; but in shorter Voyages they content themselves with doing it but every two Hours; tho' always the oftener 'tis done, the better.

And from hence plainly appears the gross Error of having but 42 Feet or 7 Fathom between Knot and Knot, which is the common Division of the *Log-line* at Sea. Indeed, being sensible their Divisions are too short, they lessen their Half-minute Glafs proportionably, as having that made of only 24 or 25 Seconds. But this is nothing but correcting one Blunder or Error by another; and shews plainly that the Common Sailors will not go out of their way, tho' they are sure they are in the wrong.

Commonly in the Steerage, or some such convenient Part of the Ship, hangs up a Board called the

LOG-BOARD; which is a Table divided into Five Columns, and ought to be of the following Form, or one like it.

This *Log-Board's* Account ought daily at Noon (when if possible, let there be an Observation of the Latitude) to be entered into the *Log-Book* or *Traverse-Book*, ruled and columned just as the *Log-Board* is; from whence it may be transcribed into the Journals, and how much way the Ship hath gained in her Course, estimated daily.

To measure whether the Half-minute Glafs be true, or to make one upon Occasion, when you can get ashore, you may use this Method:

Fasten a moderately heavy Plummot or Weight at the End of a small String, which hang up against a Wall by a small Pin or Wire, &c. and let its Length from the Pin where it hangs, to the Center of the Plummot or Weight, be just 39 Inches $\frac{1}{4}$. Then draw by the Lines hanging still, a Perpendicular on the Wall behind, with a Pencil or some such thing: And taking the Plummot in your Hand, move the Pendulum from the Perpendicular either way 6 or 7 Inches, and then let it swing freely by

Hour of the Day.	Ships Course.	Log-lines run		Winds, Weather, Accidents, &c.
		Knots.	Feet.	
1	S. W. b. S.	4	5	W.N.W. a moderate Gale.
2				
3				
4				
5				
6	S.	8	5	W.S.W. a strong (Gale.
7				
8				
9				
10				
11	N.W.b.N.W.	7	0	W. b. S. Thick (hazy Weath.
12				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

the Wall; after which take your Half-minute Glafs, and turn it up just when you see the String come right against the Perpendicular on the Wall, and then count the Swings of the Pendulum from its passing by the Perpendicular; and if your Glafs is out, just when it hath made 30 Swings, it is right, else not; for this Pendulum swings exactly Seconds.

LOGARITHMS, which Captain *Halley* very well defines to be the Indexes of the Ratio's of Numbers one to another, were first invented by my Lord *Neper*, a Scotch Baron; and afterwards completed by Mr. *Henry Briggs*, Savilian Professor of Geometry at Oxford.

1. *Logarithms* are a Series of Artificial Numbers (invented for the Ease and Expedition of Calculation) proceeding in an Arithmetical Proportion, as the Numbers they answer to do in a Geometrical one: As for Example,

1, 2, 4, 8, 16, 32, 64, 128, 256, are Numbers proceeding from Unity, in a Geometrical Proportion continued. Now if over these you place a Series of Numbers (beginning with 0) in an Arithmetical Proportion, they will stand thus:

0 1 2 3 4 5 6 7 8 9
1. 2. 4. 8. 16. 32. 64. 128. 256. 512, &c.

And the Numbers above, beginning with (0); and Arithmetically Proportional, are called *Logarithms*.

2. The Addition and Subtraction of *Logarithms* answers to the Multiplication and Division of the Numbers they answer to. Thus the *Logarithm* 2 added to 4, makes the *Logarithm* of 6, whose corresponding Number is 64. (the Product of the Number 4 multiplied into 16). Also the *Logarithm* 5 subtracted from 9, leaves the *Logarithm* of 4, whose Number is 16, (equal to 512 divided by 32).

And the Case would be the same if any other Rank of Numbers in an Arithmetical Proportion were

were made to answer to the Numbers below. And therefore there may be many sorts of *Logarithms*, as indeed there are.

And thus also will Extraction of Roots be performed by bisecting the *Logarithms* of any Numbers for the Square Root, and trisecting them for the Cube: As for Instance,

To extract the Square Root of 256, divide its *Logarithm* 8 by 2, and it will quote 4; which *Logarithmick* Number 4, hath for its absolute Number 16, and therefore 16 is the Square Root of 256.

To extract the Cube Root of 64, divide its *Logarithm* 6 by 3, and the Quote will be 2, which is the *Logarithm* of 4, the Cube Root of 64.

3. To apply this Matter for the making of a Canon or Table of *Logarithms*, that should answer to Common Numbers in their natural Order, the Inventors proceeded in this Method:

They pitched on those which are naturally Geometrically proportional; as

1, 10, 100, 1000, 10000, 100000, 1000000, 10000000, &c.

And to these they fitted not the single *Logarithms*, 0, 1, 2, 3, &c. as in our Instance, Numb. 1. above, but those augmented with many Cyphers, in order to fit proper *Logarithms* for all intermediate Numbers between 1 and 10, 10 and 100, 100 and 1000, &c. They made therefore 0000000 to be the *Logarithm* of 1, and 10000000 to be the *Logarithm* of 10; also 20000000 they put for the *Logarithm* of 100, and 30000000 for the *Logarithm* of 1000, making still the Index or Characteristick of the *Logarithm* to be one less than the Number of Places in the Absolute Number, because they appointed 0000000 as the *Logarithm* of 1.

5. But then the greatest Difficulty and Pains was yet to come, which was to find *Logarithms* for all the intermediate Numbers corresponding with those appointed for 1, 10, 100, 1000, &c. which with most indefatigable Pains and Care they thus effected. In order (i. e.) to get the *Logarithm* of 9, they found a middle Proportional between the absolute Numbers 1 and 10, encreased with seven Cyphers each: Then that Number not being exactly the absolute Number 9, but bigger or lesser than 9, (with seven Cyphers added to it) they accordingly found out new Geometrical mean Proportionals between that Number and 10, if it were less; and between that and the next less than it, as soon as it came to be bigger, &c. till at last, after a prodigious Number of Trials, viz. 25. they came to the absolute Number 8, 9999998, which approacheth very near to 9, 0000000. And in order to find the *Logarithm* of this Number 8, 9999998, they found an Arithmetical mean Proportional between the *Logarithm* of 0 and 10 (i. e. between 0000000 and 10000000). And then another between that so found, and 10000000 again; and so on, 'till at last they came to 0, 9542450. the exact *Logarithm* of 9.

They were forced to proceed after the same manner also to gain the *Logarithm* of 5; but then their Work grew something easier, and more expeditious.

1. For since by dividing 10 by 5, the Quotient is 2; therefore the *Logarithm* of 5, subtracted from the *Logarithm* of 10, must give the *Logarithm* of 2.

2. And as 10, multiplied by 2, gives 20; therefore the *Logarithm* of 9 being divided by 2, or halved, must give the *Logarithm* of 3.

3. Since the Square Root of 9 is 3; therefore the *Logarithm* of 9 being divided by 2, or halved, must give the *Logarithm* of 3.

4. By subtracting the *Logarithm* of any one known Number, from that of another; you have the *Logarithm* of the Quotient of the former Number dividing the latter.

And after this or the like manner they proceeded till they had compleated the Canon of *Logarithms* to Numbers reaching to 10000.

If you would see an easie and expeditious way of making several sorts of *Logarithms* to a large Radius, consult Capt. Edm. Halley's *Discourse in Phil. Trans.* N. 216. Where from the pure Consideration of Numbers, and withal by the Help of Sir Is. Newton's Method of finding the *Uncie* of the Numbers of a Binominal Power, he shews how to find readily the *Logarithms* of all Numbers to above 30 Places; and he gives there several *Series* for this Purpose; some Universal, and some appropriated to peculiar sorts of *Logarithms*.

Nicholas Mercator also did a good while since make some Improvements in this Affair, of which you have Dr. Wallis's Thoughts in *Phil. Trans.* N. 38.

And John Gregory hath also shew'd a way to make *Logarithms* to 25 Places, by means of the *Hyperbola*.

For the Characteristick of a *Logarithm*, see in Index.

The Use of the Table of *Logarithms*.

1. To find a *Logarithm*.

N. B. I here describe only the Common Canon of *Logarithms* contrived by Mr. Briggs, and published in Sir Jonas Moore's *Mathematicks*, and in most Books of *Trigonometry*, *Navigation*, &c.

1. If the Number, whose *Logarithm* you would find, be under 100, you have it always in the first Page: Thus the *Logarithm* of 55 is 1.740363.

2. If the Number consists of three Places, that is, a Number under 1000, look for it in the Table under N. and the *Logarithm* is found in the Column under 0. Thus the *Logarithm* of 216 is 2.334454.

3. If the Number be of four Places, and under 10000, seek the three first Figures under N. as before, and the last Figure on the Top; under which, in that Column lineally against the first three Figures, you have the *Logarithm* required: Thus the *Logarithm* of 3583 is 3.554247, and 358 under N. against which, in the Column under 3, stands your *Logarithm*.

4. If the Number be above 10000, and under 100000, you must find it by the Difference and Table of Parts Proportional: Thus, if the *Logarithm* of 35786 be required, first seek the *Logarithm* of the former four Figures 3578, which will be 3.553649; and the common Difference under D. is 121: With this Difference enter the Table of Parts proportional, and find 121 in the first Column under 3: and then lineally against that Number, and under 6, the last Figure of the Number 35786, found at the Head of the seventh Column, you will find 72; which being added to the *Logarithm* of 3578, viz. 553649, makes 4.553721, the *Logarithm* of 35786; and the Index must be 4, because the Absolute Number consists of five Places.

5. If the Number be above 100000, and under 1000000, as suppose 357865; then find (as before) the *Logarithm* of the first five Figures, viz. 35786, and 'twill be found to be (omitting the Characteristick

stick 4) 553721 : After this, multiply the remaining Figure (5) of the given Number, by the common Difference 70, (found under D.) and 'twill produce 350 ; then cut off (6) the last Figure of the Product, and add the remaining (35) to the Logarithm 553721 aforesaid, the Sum is 553756 ; to which prefix the proper Characteristick (5) because the Number given hath six Places, and 5.553756 is the Logarithm required for 357865.

If the Number be above 1000000, and under 10000000 ; find the Logarithm of the first five Figures (as before) and multiply the common Difference by the two remaining Figures ; from which Product cut off the two last Figures, and add the other (as before) prefixing 6 for a Characteristick, &c.

7. And so for any other greater Number proportionably ; only be sure to cut off from the Sum so many Figures as you multiply the common Difference by ; and add the Remainder to the Logarithm, and prefix the Characteristick proper, that is, a Figure of one place less than the absolute Number, whose Logarithm is required.

2. Next I will shew the Way of finding the Number answering to a Logarithm given.

Omitting the Characteristick, seek in the Table for that Logarithm, which is equal or next less to the Logarithm given, the Absolute Number in the Column under N, with that on the Top over the Logarithm, is the Number desired, which must be ordered according to the Characteristick.

Thus, to find what Number answers to the Logarithm 3.544821 ; omitting the Index 3, I find 544821 to answer to 3506, which the Index 3 shews to be all Integers ; but if the Index had been 1, then the Number would have been 35.06, that is, 35 Integers and .06 hundred Parts.

But if the Logarithm be not exactly to be found in the Tables, and five places be required, find the Number to four places (as before) noting the common Difference under D, then take the Difference betwixt the Logarithm given, and the Logarithm found in the Table less than it ; seek the common Difference in the Table of proportional Parts under D, and in that Line find out the Difference of the Logarithms, and at the Top just about it you have the fifth Figure : Thus, if the Logarithm required had been 2.343612, the Logarithm next less is 543571, answering to 3496 ; the common Difference is 124, the Difference of the Logarithms is 41, which, in the Table of proportional Parts against 124, gives 3 ; so that the Absolute Number is 34963 : And because the Index is 2, the Number will be 349 Integers, and $\frac{13}{100}$ Parts, or 349.63.

To find the Number of a Logarithm, whose Index is 5 or more.

Suppose 4 to be the Characteristick, and find (by the foregoing Directions) the Logarithm as near as you can (so it be but less) ; then subtract this Logarithm from the Logarithm given ; and to the Right Hand of the Remainder, if the Index be 5, set 0 ; if the Index be 6, set 00 ; if 7, set 000 ; and so on proportionally : This done, divide the Sum by the common Difference, and the Quotient gives the Figure or Figures to be placed on the Right Hand of the Number answering to the first found Logarithm.

Example.

Let 6.64876 be the Logarithm given : Suppose 6 to be 4, the nearest Logarithm less will be 4.648974, whose Absolute Number is 44563. Subtract 4.648974 from the given Logarithm, the Remainder is 2 ; to the Right Hand of which set 00, (because the Characteristick was 6) the Sum is 200 ; which divide by the common Difference 97, the Quotient is 2, (and an inconsiderable Fraction, which you may omit) which 2 set on the Right Hand of 44563, it makes 445632 ; but since the Index is 6, the Number must have 7 places ; therefore set 0 on the Right again, and it makes 4456320, which is the Number nearly corresponding to the Logarithm 6.648976.

Addition, Subtraction, Multiplication, and Division in Logarithms.

3. In the Addition of two or more Logarithms together, observe these Rules :

1. If the Indices be Integers, add them as is usual in common Arithmetick.

2. If the Indices be some Integers, and some the Indices of Parts or Fractions, they will be unlike ; and therefore if when added, their Sum be 10, or above, cast away 10, the Remainder is the Index of Integers ; if under 10, Decimal Parts : Thus,

2.057821	2.237242
7.583210	9.875062
	8.698971
9.641031	0.811275

3. If the Indices be all Decimals, and when added, make a Sum under 10, then add 10 to the Sum ; if just 10, then add Unity ; as above 10, cast 10 away, and the Index thus gotten is always Decimal Parts : Thus,

9.397941	8.698972
9.875062	9.875061
9.273002	8.574033

4. Subtraction of Logarithms.

1. If the Indices be Integers, then proceed as usually.

2. If the Indices be either of them, or both, Decimal Parts, observe whether the Index of the upper Quantity be a smaller Number than that of the subtrahend or the lower ; if it be, add 10 to it : And if the upper be of a greater Value than the lower, (that is, a bigger Index by Place) then the Remainder will be Integers ; if not, Decimal Parts.

Examples.

2.033421	9.875062	9.875062	1.235781
9.875062	2.033421	8.574031	3.572141
2.158359	7.841641	1.301031	7.663640

5. The Logarithm of a Fraction is thus found.

Subtract the Logarithm of the Denominator from the Logarithm of the Numerator, the Remainder gives the Logarithm of the Fraction ; as of $\frac{3}{4}$, the Logarithm of 4 is 0.602060, out of the Logarithm of 3, 0.477121, the Difference 9.875061 is the Logarithm of $\frac{3}{4}$, or 75.

6. To Multiply a Logarithm.

If the Index be Negative, observe, That in multiplying the Figure next the Index, the Tens to be carried in Mind are Affirmative, and are to be deducted out of the Product of the Negative Indices : Thus,

$$\begin{array}{r} 2.543211 \\ 3 \\ \hline 5.629633 \end{array} \quad \begin{array}{r} 1.987214 \\ 5 \\ \hline 1.936070 \end{array}$$

7. To Divide a Logarithm, having a Negative or Fractional Index.

Observe whether the Divisor will evenly divide the Index, then there is no Difficulty ; but if it do not evenly divide the Index, add to the Index so many Units, till it may be evenly divided, setting the Quotient down for a new Index, augmenting the next Figure by so many times 10 as you added to the first.

$$\begin{array}{r} 3) 5.321412 \\ 2.440470 \\ \hline \end{array} \quad \begin{array}{r} 2) 5.61228 \\ 3.80614 \\ \hline \end{array}$$

8. Multiplication of Numbers by the Logarithms.

Add the *Logarithms* of the Numbers together, and the Sum is the *Logarithm* of the Product required.

Multiplicand,	32	1.505150	5.12	0.709265
Multiplier,	52	1.71003	1.55	0.899497
	1664	3.221153	7.936	0.899497

9. Division of Numbers by Logarithms.

This is done only by subtracting the *Logarithm* of the Divisor from the *Logarithm* of the Dividend ; and the Remainder will be the *Logarithm* of the Quotient.

Dividend	7286	3.862489	.5512	9.654369
Divisor	32	1.505150	.0315	8.498311
Quotient	227.8	2.357359	1.432	1.156058

10. Extraction of Square, Cube, &c. Roots by Logarithms.

To extract the Square Root of any Number, is to divide the *Logarithm* of that Number by 2, for the Cube Root by 3. &c. That is, in general, divide the *Logarithm* of the Number, by the Index of the Power.

Number	75832	Log. 4.879852	
Square Root,	275.37	2) 2.439926	{ for the Square R.
Cube Root,	42.327	3) 1.626614	{ for the Cube Root.

11. To find a Mean Proportional betwixt two given Numbers by Logarithms.

Half the Sum of their *Logarithms*, gives the *Logarithm* of the Mean Proportional betwixt them.

$$\begin{array}{r} \text{The Numbers are, } \begin{cases} 9 & 0.954242 \\ 16 & 1.204120 \end{cases} \\ \hline \text{Sum, } 2.158362 \end{array}$$

$$\text{Mean Proportional, } 12 \quad S = 1.079181.$$

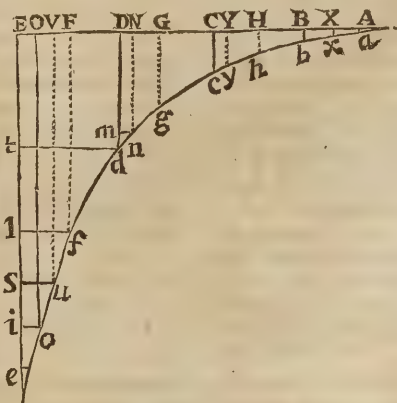
To find any Number of Mean Proportionals betwixt any two Numbers.

Take the Difference of the *Logarithms* of the two given Numbers, which divide by a Number more by one than the Number of Means desired ; and this *Logarithmerick* Quotient added to the *Logarithm* of the least, gives the *Logarithm* of the first Mean next it ; and then added to the last Sum, finds the next, &c.

As suppose it were required to find 3 Mean Proportionals between 4 and 64 ; the *Logarithm* of 4, is 0.602060 ; of 64, is 1.806180 ; their Difference, 1.204120 divided by 4, (i. e. 3 + 1) gives 0.301030 ; which added to the *Logarithm* of 4, makes 0.903090, the *Logarithm* of 8, the first Mean ; and again, added to the last Sum, gives 1.204120, the *Logarithm* of 16 ; and again added, gives the *Logarithm* of 32 ; which are the three Means betwixt 4 and 64.

LOGARITHMICK-LINE of *Pardie*, is a Curve which discovers perfectly all the Mysteries of *Logarithms*, with several other very excellent Properties and Uses ; and is thus delineated.

Let the Right Line *AE* be divided into the equal Parts *AB, BC, CD, DE, &c.* from the Points *A, B, C, D, E, &c.* let the Lines *Aa, Bb, Cc, Dd, and Ee*, be drawn all perpendicular to *AE*, and consequently parallel to one another.



And let them all be in a Geometrical Progression ; as let *Aa* be 1, *Bb* be 10, *Cc* 100, *Dd* 1003, *Ee* 10000, &c. Then shall we have two Progressions of Lines, Arithmetical and Geometrical : For the Lines *AB, AC, AD, AE*, are in Arithmetical Progression, or as 1, 2, 3, 4, 5, &c. and so do represent the *Logarithms* to which the Geometrical Lines *Aa, Bb, Cc, &c.* do correspond.

Let each of the equal Parts *ED, DC, CB, &c.* be divided equally again in *F, G, H* ; and let the Parallels *Ff, Gg, &c.* be drawn, and be Mean Proportionals between the collateral ones ; that is, *Ee : Ff :: Ff : Dd :: Dd : Gg, &c.*

K k k

Let

Let there also be more Mean Proportionals drawn from the Middle of each Subdivision $EF, ED, DG, &c.$ and so on, till these parallel Lines growing very numerous, have at last but a very small Distance from each other: Then imagine a Curve Line drawn through all the Extremities of these parallel Lines, as $e o u d g b a$, and this is called the *Logarithmical Line*.

If this Figure were drawn on a very large Table, and with all requisite Exactness, each Part, $AB, BC, &c.$ might be divided not only into an 100 or 1000, but even into 10000, 100000 equal Parts, and more: So that AB being 100000, AC would be 200000, AD 300000, $&c.$ as must always be in an Arithmetick Progression.

The Line Ee being supposed to contain 10000 Parts, let us imagine through each of those Divisions a Parallel to be drawn to the Line AE , cutting the Curve in so many Points, *v. gr.* let the Line io be drawn through the Division 9900 of the Line Ee , and which cuts the Curve in the Point o . Let there be also supposed the Parallel Oo , cutting the Line AE in the Division 39963; then any one may know that 399563 is the *Logarithm* of the Number 9900. In like manner, if Su passed through the Division 9000 of the Line Ee , the Line Vu were drawn cutting AE in 395424, then would that Line uV be the *Logarithm* of 9000, $&c.$

So that by this means a Table of *Logarithms* from 1 to 10000, may easily be made; and farther, by producing the Line AE .

Note. To obtain all the *Logarithms* from 1 to 10000, 'twill be enough to seek the *Logarithms* from 1000 to 10000; that is, (having drawn the Parallel de) to take the *Logarithms* of all the Divisions from e to e ; which *Logarithms* are all contained between E and D : For by this you will have the *Logarithms* of all the Parts that are between e and E , and whose *Logarithms* lie between D and A . For Example; Since Oo is 9900 Parts, and its *Logarithm* 399563, the same Number may be taken for the *Logarithm* of 990, which is Nn : As also of the Number Ty 99, changing only the first Figure 3; because, according to the Composition of this Line, ON or Ny , ought to be equal to ED or DC ; as any one may easily prove: So that ON or Ny , will contain 100000. And because AO is 399563, subtracting ON 100000, there will rest 199563 for Ay . And after the same manner, having Ay 395424 for the *Logarithm* of Vv , which is 9000, you may have also 095424 for the *Logarithm* of Xx , which is 9; or 195424 for the *Logarithm* of 90; or 295424 for the *Logarithm* of 900.

All this may be reduced to Practice for Calculation, without actually drawing these Figures, but only imagining them to be drawn: For by the Rules of Common Arithmetick, we may find out Ff , the Mean Proportional between dD and Ff , or between Ff and Ee , $&c.$ But what we have here explain'd, is sufficient to gain the Knowledge of the Nature and Composition of the *Logarithms*.

Though indeed there will not arise such Advantage for making *Logarithms* by this Observation, as it may at first Sight seem to promise; because there are 9000 Numbers between 1000 and 10000, whose *Logarithms* must be found also; and but 900 between 100 and 1000, and but 90 between 10 and 100, and but 9 between 10 and so in all 999, which is not the Ninth Part of the former.

In *Phil. Trans.* N. 245, is a Quadrature of that Part of the Space contained between any two Ordinates of the Curve and this *Alciffa*, by Mr. John Craig; and Dr. Barrow, in his *Lectiōes*, hath carried the Matter farther: See in *Philosophical Transactions*, N. 38. An Account of a very short Way of making *Logarithms*, contrived by Nicholas Mercator, with Dr. Wallis's Thoughts upon it, and Additions to it.

Mr. James Gregory also, in his *Vera Quadratura Circuli & Hyperbola*, Printed at Padua, A. D. 1667. applies the Quadrature of the Hyperbola to the making of *Logarithms*, and computes the *Logarithm* of 10 to 25 Places.

But our Learned Capt. Halley, in *Phil. Trans.* N. 216, gives a Way from the bare Consideration of Numbers only; and withal, by the Help of Sir Isaac Newton's admirable Invention, to find the *Uncie* of the Members of any Power, (which you have under the Word *Uncie*) most compendiously to find the *Logarithms* of all Numbers to above 30 Places, with more Ease and Expedition than was ever done before: And he gives there several *Series* for this Purpose, some universal, some applicable to one sort of *Logarithms*, and some to another.

LOGARITHMETICK Curves, is the same with *Pardie's Logarithmetick Line* above described.

LOGICK, is the Art of right Thinking, or using our Rational Faculty aright: And the Power or Force of Reason, unassisted by Art, is called *Natural Logick*.

Logick is derived from those Reflections which Men have made on the Four Principal Operations of the Mind, *viz.* *Apprehension, Judgement, Discourse, and Method or Disposition*; which see.

The Business of *Logick* is chiefly to teach us how to make proper Animadversions on the Operations of our Minds; and from its true Use we gain these Three Advantages.

First, We are thereby assured that we make a right Use of our Reason: For the Consideration of Rules, begets in us a more fervent Application and attentive Industry of the Mind.

Secondly, That thereby we more easily detect and explain the Errors and Defects which we meet with in the Operations of the Mind: For oftentimes it falls out, that we discover by the meer Light of Nature the Faults of Ratiocination; yet are not able to give a Reason why it is false: Thus they who know not what belongs to Painting, may take Exceptions at the Defects of a Picture, tho' they are not able to tell the Reason why they find fault.

Thirdly, That we are brought to a more accurate Knowledge of the Nature of our Understanding by these Reflections upon the Operations of the Mind, which, if we look no farther than meer Speculation, is to be prefer'd before the Knowledge of all Corporeal Things.

LOGISTICAL Arithmetick, was formerly the Arithmetick of Sexagesimal Fractions, and used by Astronomers in their Calculations. I suppose it was so called from a Greek Treatise of one *Barlaamus Monetias*, who wrote about Sexagesimal Multiplication very accurately, and entituled his Book, *λογιστική*. This Author *Vossius*, in his Book *de Scientiis Mathematicis*, places about the Year 1350, but mistakes it for a Treatise of Algebra.

Thus also *Shakerly*, in *Tabule Britannicæ*, hath a Table of *Logarithms* adapted to Sexagesimal Fractions, which therefore he calls *Logistical Logarithms*; and the Expeditious Arithmetick of them, which is by this Means obtained, and by which all the

the Trouble of Multiplication and Division is saved, he calls *Logistical Arithmetick*; though some by **LOGISTICKS**, will understand the first General Rules in *Algebra of Addition, Subtraction, &c.*

LOHOCH, or *Loch*, the same with *Eclegma*.

LONCHITES, or *Hastiformis*, a Species of Corners resembling a Lance or Spear: Its Head is of an Elliptick Form, and its Tail or Stream of Rays very long, thin, and pointed at the End.

LONG Accent, in Grammar, shews that the Voice is to stop upon the Vowel that has that Mark, and it is expressed thus, (-).

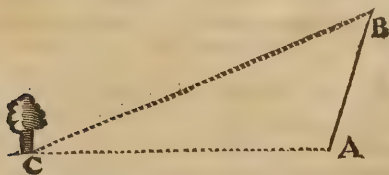
LONG-BOAT, is the largest and strongest Boat belonging to a Ship, that can be hoisted aboard of her: Its Use is to bring any Goods, Provision, &c. to or from the Ship; or, on Occasion, to land Men any where; and particularly to weigh the Anchor; for which End she hath a *David* to be set over her Head, with a *Shiver* in it, in which the *Buoy-rope* runs, to weigh the Anchor. She hath Mast, Sail, and Oars, as other Boats, as also her *Tiller* to the Rudder, which answers to the *Helm* of a Ship.

LANGANON, the last Gut: See *Intestinum rectum*.

LONGIMETRY, is the Art of measuring Lengths or Distances: Or to take the Distances of *Trees, Steeples, or Towers, &c.* either one or many together; for which Purpose the *Theodolite* is reckoned to be the best Instrument, whereof we'll give the following Instances.

To Measure one single Distance.

As suppose you stand at *A*, and would know the Distance to the Tree at *C*.



1. Set your Instrument at *A*, laying the *Index* with *Sights*, on the North and South Diameter, and turn it about till through the *Sights* you see the Tree at *C*, there fix your Instrument fast.

2. Then from *A*, measure any Number of Feet, Yards, or the like, any way; as to *B* 100 Foot, and set up a Mark at *B*.

3. Take the Angle *BAC*, 120 deg. 10 min. which set down.

4. Set a Mark at *A*, and remove your Instrument to *B*, and take the Angle *ABC* 50 Degrees.

Now you have an *Oblique Angled Triangle*, where-in there is given the Angles *BAC* 120 deg. 10 min. *ABC* 50 deg. and the Distance *AB* 100 Foot, and consequently the Angle *C* 9 deg. 50 min. (being the Complement of the other two, to 180 deg.)

$$\text{Then } S. B C A : A B :: S. C B A : A C$$

$$9^{\circ} 50' : 100 :: 50^{\circ} 00' : 448, 6$$

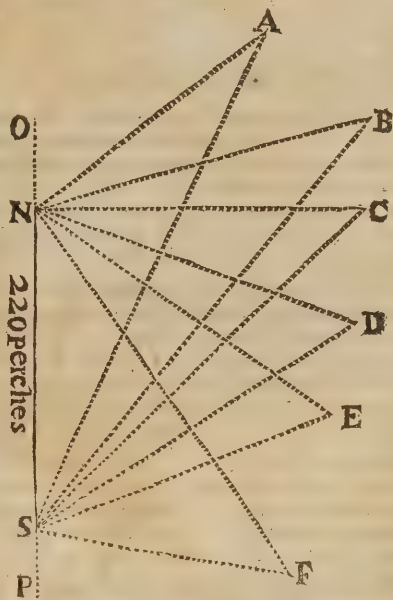
$$\text{And } S. C B A : C A :: S. \text{compl. } C A B : C B$$

$$50^{\circ} 00' : 448, 6 :: 59^{\circ} 50' : 506, 2$$

So the Distance from *C* to *A* is 448, 6 Foot and from *C* to *B* 506, 2 Foot;

How to take the Distances of divers Things remote from you; as, Churches, Towers, Ships at Sea, or such like; and to make a Map of the same.

Suppose that the Points *A, B, C, D, E* and *F*, were Houses, Churches, Towers, or the like, and that it was required to make a Draught of them, representing their Situation and true Distance one from another.



Let your Stations be *S* and *N*. Set your Instrument at *N*, and turn it about upon the Socket till the Needle hang directly over the *Meridian Line* of the *Chard* in the Bottom of the Box, the North end of the Needle over the *Flower-de-lis*; then skrew your Instrument fast.

Then turn the *Index* about, till through the *Sights* you see *A*, and note what Degree the *Index* cuts, which suppose to be 60. Then turn the *Index* about till you see *B*, and mark what Degrees is cut by the *Index*; as 74 deg. 30 min. Do thus with all the rest, be there never so many.

Also measure the Distance between *N* your first Station, and *S* the second Station; which is 220 Perches: And bring your Instrument from *N* to *S*, where it must be set up, laying the *Index* upon the North and South Diameter: Turn it about till you see the first Station *N*, then fix it.

And turn the *Index* about, till thro' the *Sights* you see *A*, and note what Degrees the *Index* cutteth; as 31 deg. 30 min. Then turn the *Index* about to *B, C, D, &c.* noting the Degrees cut by the *Index* at every moving, and set them down in a Table ruled for that Purpose, thus,

	At the first Station the Index cut.		At the second Station the Index cut.		Stationary Distance is 220 Perches.
	D.	M.	D.	M.	
A	60	00	31	30	Stationary Distance is 220 Perches.
B	74	30	38	40	
C	84	30	43	20	
D	104	50	54	00	
E	117	00	68	10	
F	145	10	97	00	

How to Protract these Observations.

1. Draw a Line at Length, as *OP*; whereon take any Point, as *N*, for your first Station: Apply the Center of your Protractor to *N*, and its Diameter upon the Line *OP*.

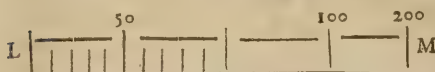
2. Having your Table of Observations before you, prick off the Degrees observed, along the Limb of your Protractor; and draw the obscure Lines *NA*, *NB*, *NC*, &c.

3. From some Scale of equal Parts (answerable to the Bigness you intend your Plot) take off 220 Perches, and set them from *N* to *S*.

4. Apply the Center of the Protractor to *S*, and its Diameter upon *OP*, and prick off your Observations at the second Station; and draw the obscure Lines *SA*, *SB*, *SC*, &c. (from *S*, through the several Marks made on the Paper) cutting the Lines drawn before, *NA*, *NB*, *NC*, &c. in the Points, *A*, *B*, *C*, *D*, &c. which Points shall represent the several Ships, as they lie at Anchor; or the several Towers, or remarkable Places to be plotted.

To make a Scale to measure any Distance upon this Plot.

Let a Line be so divided, that the Distance *NS* may be 220 Parts thereof, as the Line *LM*; for the Distance *NS*, set upon this Scale, will reach from 200 to 20 on the small Divisions.



And the Scale being thus Divided and Numbred, you may measure any Distance upon the Plot.

To measure any Distance, thus laid down, by Trigonometrical Calculation.

The Visual Lines made at both Stations, by their Intersections, do constitute several Right-lined Triangles; in either of which you will have enough given to find whatsoever Distance you shall require; as suppose the Distance *NA* were required.

In the Right-lined Triangle *ANS*, you have given; the Angle *ANS*, 120 deg. (being the Complement of 60 deg. the Angle observed at *A*, to 180 Degrees) The Angle *NSA* 31 deg. 30 min. being the Complement of the other two, to 180 Degrees.

Therefore, as *S, NAS : NS :: S, NSA : NA*.

To find *AS*, say,
As, *S, NAS : NS :: S, ANS : AS*.

By the same Method any other Distance may be found: And in this manner may the Maps or Plots of all eminent Places in Cities, Towns, &c. be taken.

LONGISSIMUS Pollicis: See *Flexor tertii Internodii*.

LONGISSIMUS Femoris; vid. *Sartorius*.

LONGITUDE of a Place, is an Ark of the Equator intercepted between the Meridian of that Place, and the first Meridian: Or 'tis more truly the Difference, either East or West, between the Meridians of any two Places, counted on the Equator.

LONGITUDE in the Heavens, is an Ark of the Ecliptick, counted from the beginning of *Aries*, to the place where the Stars Circle of Longitude crosses the Ecliptick: So that, 'tis much the same as the Stars Place in the Ecliptick, reckoned from the beginning of *Aries*; which how to find: See, *Place of the Sun or Star*.

LONGITUDE of the Sun or Star from the next Equinoctial Point, is the Number of Degrees and Minutes they are from the beginning of *Aries* or *Libra*, either before or after them; which can never be more than 180 Degrees.

LONGITUDE in Navigation, is also the Distance of a Ship or Place, East or West from another (counted in proper Degrees); but if in Leagues or Miles, or Degrees of the Meridian, and not in those proper to the Parallel of Latitude, it's commonly called *Departure*.

LONGITUDE in Drolling. The Ark of the Equinoctial, intercepted between the Subtilar Line of the Dial and the true Meridian, is called the Planets Difference of Longitude.

To find the Longitude and Latitude of any Star by the Globe.

Bring the Solstitial Colure to the Brafs Meridian, and there fix the Globe; then will the Pole of the Ecliptick be just under 23 deg. 30 Min. accounted from the Pole above the Horizon, stand on the same Meridian: There skrew the Quadrant of Altitude, and then bring its graduated Edge to the Star, and there stay it; and so the Quadrant will cut the Ecliptick in the Star's Longitude, as also its Latitude on the Quadrant, reckoned from the Ecliptick.

LONGITUDE of Motion, is a Term used by Dr. Wallis in his *Mechanicks*, and others, for the Measure of Motion estimated according to the Line of Direction; so that 'tis the Distance or Length which the Center of any moving Body runs through, as it moves on in a Right Line.

And he calls the Measure of any Motion estimated according to the Right Line, or Line of Direction of the *Vis Motrix*, the *Altitude* of it.

LONGUS a Muscle of the *Cubiti*, which helps to extend the Arm forwards.

LONGUS, a Muscle of the *Radius*, serving to turn the Palm of the Hand upwards.

LONGUS, a Muscle of the *Tarsus* so called: See *Peroneus Primus*.

LONGUS Colli, is a Muscle of the Neck which arises partly tendinous, but chiefly fleshy, from the fore-part of the Five Vertebrae of the Thorax; and being dilated in its Middle to a fleshy Belly, is inserted to the fore-part of all the Vertebrae of the Neck: This with its Partner acting, bends the Neck right forward. Between this and the *Scalenus* lies the *Rectus Internus Major*.

LOOF, or as they usually pronounce it, *Luff*, is a Term used in Conding of a Ship: Thus *Loof up*,

is to bid the Steers-man keep nearer to the Wind. To *Loof into an Harboir*, is to Sail into it, close by the Wind. To *spring the Luff*, is when a Ship, that before was going *large* before the Wind, is brought close, or, as they say, *claps* close by the Wind. When a Ship sails upon a Wind, as they say, that is, on a Quarter-Wind, the Word of him that cons to the Steers-man, is, *Luff! Keep your Luff! Veer no more! Keep her to! Touch the Wind! Have a care of the Lee-latch*: All which Words signifie much the same thing, and bid the Man at Helm to keep the Ship near the Wind. But on the contrary, if the Ship is to go more *Large*, or Right before the Wind, the Word is, *Ease the Helm! No near! Bear up!*

Steady, is a Word common to both these ways of Sailing, either on a *Wind*, or *Large*, and signifies, that the Man at Helm should keep the Ship straight to her Course, and not let her go in and out, or make *Tawes*, as they call it.

LOOF-HOOK, is a Tackle aboard a Ship, with two Hooks to it, one of which is to hitch into the *Crengle* of the Main and Fore-fail, and the other is to hitch into a certain *Strap*, which is spliced into the *Cheffe-tree*, and so down the Sail. Its Use is to succour the *Tackles* in a large Sail, that all the Strefs may not bear upon the *Tack*. Sometimes also 'tis used when the *Tack* is to be seized the furer.

LOOF of a Ship, is that part of her *a-loft*, which lies just before the *Cheffe-trees*; and hence the Guns that lie here are called her *Loof-Pieces*.

LOOF-TACKLE, or *Luff-Tackle*, is a small Tackle in a Ship, serving to lift all small Weights in or out of a Ship.

LOOME: If a Ship appears big at Sea, when seen at a Distance, they say, she *loomes*, or appears a great Sail.

LOOME-GALE, is a gentle, easie Gale or Wind, in which a Ship can carry her Top-sails *a-trip*: see *Trip*.

LORIDOIDES, the same with *Lepoides*.

LORD, by the Writers of the Law, is divided into *Lord Paramount* and *Lord Mesne*.

Lord Mesne, is he that is Owner of a Mannor, and by Virtue thereof hath Tenants holding of him in Fee, and by a Copy of Court-Roll, and yet holdeth himself of a superior Lord, called *Lord Paramount*. Also he is called *Lord in Gros*, that is, a Lord having no Mannor, as the King in respect of his Crown: And there is a Case wherein a Private Man is *Lord in Gros*; as when a Man makes a Gift in Tail of all the Land he hath, to hold of him, and dieth, his Heir hath but a *Seigniori in Gros*.

LORDOSIS, by some Writers, is the Term for the bending of the Back-bone forwards in Children, &c.

LOTION, a Term used by some Chymists and Pharmacal Writers, signifying only the washing of any Medicine in Water. Some also call Remedies which are between a *Fomentation* and a *Bath*, and which are used to wash the Head, or any Part affected, by this Name of *Lotion*.

LOWER Flank, or *Retir'd Flank*; see *Flank*. A Term in Fortification.

LOXODROMIQUES, is the Art or Way of oblique Sailing by the *Rhumb*, which always makes an equal Angle with every Meridian; i. e. when you sail, neither directly under the Equator, nor under one and the same Meridian, but obliquely or across them. Hence the Table of Rhumbs, or the Traverse-Table of Miles, with the Difference of Longitudes and Latitudes, by which the Sailor may practically find his Course, Distance, Latitude or

Longitude, is by Sir J. Moore, and others, called by this Name of *Loxodromiques*; and such Tables as serve truly and expeditiously to find the several Requisites, or resolve the Cases of Sailing, are called *Loxodromical Tables*.

LOZENGE, is that Figure in Heraldry which the Geometers call a *Rhombus*, i. e. a Parallelogram, whose Angles are oblique, but Sides all equal; and the Distance between the two obtuse Angles always equal to the Length of one of the Sides. Thus,



In which it differs from the *Fusil*; which see.

In this Figure all unmarried Gentlemen and Widows do bear their Coats of Arms; because, as some say, 'twas the Figure of the *Amazonian Shield*; or, as others, because

'tis the Ancient Figure of the *Spindle*.

LUCIDA Corona, a Fixed Star of the Second Magnitude, in the *Northern Garland*; whose Longitude is 217 deg. 38 min. Latitude 44 deg. 23 min. Right Ascension 230 deg. 12 min.

LUCIDA Hydra: see *Cor Hydra*.

LUCIDA Lyra, a bright Star of the first Magnitude, in the Constellation *Lyra*; whose Longitude is 10 deg. 43 min. Latitude 61 deg. 47 min. Right Ascension 276 deg. 27 min. and Declination 38 deg. 30 min.

LUCIFEROUS, that which brings Light; a Word used by my Lord Bacon, and some other Naturalists, for such Experiments in Philosophy as do not so much enrich a Man, as inform and enlighten his Mind about some Physiologial Truth, or Speculation in Physicks.

LUES Veneræ, *Morbus Gallicus*, the *French Pox*, is a malignant and contagious Distemper, communicated from one to another by Coition, or other impure Contact; proceeding from virulent Matter, and accompanied with many ill Symptoms, such as *Gonorrhæa*'s, with the Falling-off of the Hair, Spots, Swellings, Ulcers, Pains in the Bones, &c.

LUES Deificæ: see *Caducus Morbus*.

LUFF, a Sea Term; the same with *Loof*: Which see.

LUMBAGO, is a Pain in the Muscles of the Loins, which *Blanchard* takes to be clogged with *Scorbutick Matter*; so that the Patient is forced to stand upright, being not able to sit down without great Pain.

LUMBALIS Musculi: see *Psoas Magnus*.

LUMBARIS Vena, a Vein arising from the descending Trunk of the *Cava*, and is not always one, but often two or three on each side, which they divide into the *Lumbaris Superior* and *Inferior*; they are bestowed on Muscles of the Loins, and on the *Peritoneum*.

LUMBARIE Arteries, are by some said to come from the *Aorta*, unto all the Parts of the Loins, and to the Marrow of the Back-bone; sending as many Branches to its joints, as there are Holes in it.

LUMBRICAL Muscles, are with some Anatomists, those Four Muscles which serve to move the Fingers or Toes, and are so called from their Worm-like Form.

LUMBRICALES, seu *Vermiculares*, are Muscles of the Fingers, so called from their Figure, being not much unlike the common Earth-Worms; they are also called *Flexores primi internodii digitorum*, from their Use. Those probably perform those minute Motions of the Fingers, when the second and third Internodes are curvated by the two last-treated

of Muscles; and therefore used in playing on Musical Instruments, and may be thence named *Musculi Fidiinales*.

LUMBRICALIS Pedis, is a Muscle of the lesser Toes, springing from the internal Part of the *Os Calcis*; and becoming tendinous, joyns with the Tendons of the *Perforans* in the middle of the Sole of the Foot; then dividing it self into Four (as it were) distinct fleshy Muscles, they all become tendinous at their Insertions to the internal Parts of each lesser Toe, laterally, next the Great Toe.

LUMINARIES. The Sun and Moon are so called by way of Eminence, for their extraordinary Lustre, and the great Proportion of Light that they afford us.

LUNA Cornea, is a tough insipid Mass, almost like Horn, made by pouring warily on Chrystals of Silver (which Chrystals were made by dissolving that Metal in good Aqua-fortis or Spirit of Nitre) either Spirit of Salt, or a strong Brine made of common Salt and Water. The Mixture is dried, and then brought to Fusion in a Crucible, or a Glass Phial; where, after it hath been kept a little while so, it turns into this Shape, which the Chymists call *Cornea Lune*.

In which Process, 'tis very remarkable, that tho' a Solution of Silver be commonly one of the worst of Bitters, and Spirit of Salt have a very fowre and acid Taste, yet the Union of these together, produces a Body perfectly insipid; which plainly shews that Tastes depend on Mechanical Principles, and are various, according to the various Textures of Bodies.

LUNARY Months, are either *Periodical*, *Synodical*, or *Illuminative*; which see in their proper Places.

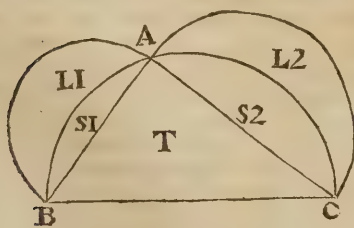
LUNAR Cycle: see *Cycle of the Moon*.

LUNATIONS of the Moon, are the Times between one New Moon and another: And this is greater than the Periodical Month by two Days and five Hours; and is called the *Synodical Month*, consisting of 29 Days, 12 Hours, and $\frac{1}{2}$ of an Hour.

LUNES, or *Lunule*, in Geometry, are Figures in the Form of a Crescent or Half-moon, made by the Arks of two intersecting Circles; as in the following Figures the Space *L* is called a *Lune*.

PROPOSITION I.

1. The Quadrature of Hippocrates his Lunes.



I say, The Triangle *T*, is equal to the two Lunes *L* 1, and *L* 2.

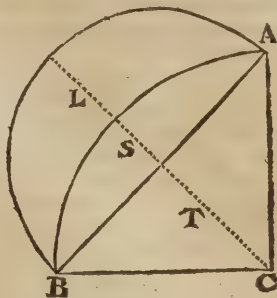
DEMONSTRATION.

The Semi-circle on *BC*, is equal to the Semi-circles on *BA* and *CA*.

And the Segments, *S* 1 and *S* 2, are common to all the three Semi-circles: Which being taken from the greater Semi-circle, they leave the Triangle *T*, and taken from the two lesser Semi-circles, they leave the two Lunes, *L* 1 and *L* 2.

Therefore the Triangle *T* = to both the Lunes *L* 1, & *L* 2.

2. Otherwise in a Quadrant,



I say, The Triangle *T*, is equal to the Lune *L*.

DEMONSTRATION.

The Triangle *T* being Quadrantal and Isoscelar, it must be that $ABq = 2BCq$.

But $2BC = \frac{1}{2}$ Square of $2BC = \frac{1}{2}$ the Square of the Diameter of the greater Circle; that is, the Square of the Diameter of the greater Circle, is double the Square of the Diameter of the lesser Circle *AB*,

Therefore the Semi-circle on $2BC =$ twice the Semi-circle *BAC*; and consequently the Quadrant *ABC* = Semi-circle *BAC*.

Take therefore from each the common Segment *S*, and there remains the Lune *L* = to the Triangle *T*. Q. E. D.

3. To square the Half of the Lune *L*.

'Tis certain, that a Right Line drawn from *C* thro' the Center of the lesser Circle, must divide both Triangle, Segment and Lune into two equal Parts, and consequently $\frac{1}{2}T = \frac{1}{2}L$: And thus the Half-Lune is squared.

4. To square any Part less or greater than Half the Lune.

Let there be a Quadrant, as before, *BAC*, and a Lune, as *L*: 'Tis required to find the Segment of the Lune *BED*, made by the Line *EC* drawn to the Center of the greater Circle; which *Pardie* saith, is as difficult as squaring the Circle. Lib. 6. Art. 64.

Slack'd-lime, of each an Ounce; Potters-Earth, or Powder of Pots, half an Ounce. Make a moist Paste of these with Whites of Eggs, well beaten before with a little Water, and this will stop exceeding close. N. B. This may be very well used to stop the Cracks that will often happen in Glass Vessels; and there must be three Lays of the Paste bound on with Paper.

Mr. Boyle recommends on Experience for this last Purpose, the following Composition, viz. Good Quick-lime and Scrapings of Cheese pounded in a Mortar, with as much Water as will just bring the Mixture to a soft Paste; then spread it on a piece of Cloth, and apply it, as Occasion requires.

LUXATION, a Term in Chyrurgery, is the Dislocation, displacing, or putting any Bone or Joint out of its place.

LUXATOR Externus, a Muscle so called: See *Externus Auris*.

LYCANTHROPIA, *Rabies Hydrophobica*, a Madness proceeding from the Bite of a mad Wolf, wherein Men imitate the howling of Wolves. *Blanchard*.

LYGMOS, the Hickets, is a convulsive Motion of the Nerves, which spread up and down the Gullet, returning after short Intermiſſions: It proceeds

from some troublesome Matter [that vellicates the *Oesophagus*. *Blanchard*.

LYMPHA, is a clear limpid Humour, consisting of the Nervous Juice and of Blood, which being continually separated by the Glandules, is at last discharged into the Blood again by Vessels peculiar to it. The *Lympha* comes not immediately from the Blood, or Nervous Juice, as some think, but it is the Superfluity of each; which was more than enough for the Nourishment of a Part, like the Marrow in Bones. It is taken sometimes for that Water which flows from the pricking of Nerves, and other Wounds; and which does not really flow from the Nerves themselves, but from the Lymphatick Vessels which are cut and wounded. *Blanchard*.

LYMPHATICK Vessels: see *Venæ Lymphaticæ*.

LYMPHEDUCTS, the same with *Lymphatick Vessels*.

LYNX, the same with *Lygmus*.

LYPYRIA, is the Term some Writers give to a kind of Fever attended with an *Erysipelas*, or Choleric Inflammation of the Stomach and Guts; and tho' the inward Parts of the Body feel very hot, yet the outward ones are very cold. *Blanchard*.

LYRA, the *Harp*, a Constellation in the Northern Hemisphere, consisting of 13 Stars.

MACHINE, or *Engine*, in Mechanicks, is whatsoever hath Force sufficient either to raise or stop the Motion of a Body. These *Machines* are either *Simple* or *Compound*.

Simple Machines, are commonly reckoned to be Six in Number, viz. the *Balance*, *Leaver*, *Pulley*, *Wheel*, *Wedge* and *Screw*. To these might be added the *Inclined Plane*, since 'tis certain that the heaviest Bodies may be lifted up by the means thereof, which otherwise could scarce be moved.

Compound Machines, or *Engines*, are innumerable; in regard that they may be made out of the *Simple*, almost after an infinite manner.

MACHINA Boyleana, Mr. Boyle's Air-pump; which see. So called from that Noble Gentleman, being the first Inventor of that Engine.

MACROCOSM, is the whole Universe, in Contradistinction to *Microcosm*; which some will have to express the Lesser World, or the Body of Man.

MACULA Eptica, is a Spot of a brown or of a sad yellow Colour, about an Hand's Breadth broad, chiefly seizing upon the Groins, the Breast and Back, nay, sometimes it covers the whole Body; is attended with a certain slight Asperity of the Skin, which lets fall Scales, or a sort of Dendrieff from it, which yet do not stick all together, but are disseminated here and there, and sometimes disappear, sometimes break out again. *Blanchard*.

MACULÆ Solares; see *Spots in the Sun*.

MACULA Volatica, is a red or purple Spot here and there in the Skin; which, if it touch any Orifice in the Body, as the Mouth, Nostrils, Eyes, Ears, &c. and pierce so far, it becomes mortal: It is often fatal to Children. *Blanchard*.

MADRIER, in Fortification, is a thick Plank arm'd with Plates of Iron, and having a Concavity sufficient to receive the Mouth of the Petard when charged, with which it is applied against a Gate, or any thing else that you design to break down. This Term is also appropriated to certain flat Beacons, which are fix'd at the Bottom of a Moat, to support a Wall. There are also *Madriers* lined with Tin, which are cover'd with Earth, to serve as a Defence against artificial Fires.

MAGDALEONES, are Pieces of Plaister made up in Form of a Cylinder, or long Roll.

MAGICK Square, is when Numbers in Arithmetick Proportion are disposed into such parallel and equal Ranks, as that the Sums of each Row, as well diagonally, as laterally, shall be all equal.

5	10	3
4	6	8
9	2	7

Thus these Nine Numbers, 2, 3, 4, 5, 6, 7, 8, 9 and 10, being disposed into this Square Form, they do every way, directly and diagonally, make Eighteen.

MAGICK-Lantern, a little Optick Machine; by the means of which are represented on a Wall, in the Dark, many Phantasms and terrible Apparitions, which are taken for the Effect of *Magick*, by those that are ignorant of the Secret. This

Machine is compos'd of a Concave Speculum, reflecting the Light of a Candle, which passeth through the little Hole of a Tube, at whose End there is fasten'd another Glas: Between these two are successively placed many small Glasses, painted with different Figures, of which the most formidable are always chosen; and such as are most capable of terrifying the Spectators; so that all these Figures may be represented at large on the opposite Wall.

A Convex Glas will do the Thing as well as a Concave one. See the Theory of it fully explained in M. Molyneux his Excellent *Dioptr. Nova*, Prop. 89. p. 183. They are sold by all Perspective-makers, and particularly by Mr. John Marshall, at the Archimedes on Ludgate-hill, London; and Mr. Yarwell in the same Street.

MAGISTERY, a Word used by the Chymists; sometimes for very fine Powders, made by Solution and Precipitation of the Matter; as *Magistry of Bismuth*, *Lead*, &c. And sometimes 'tis made to signify *Resins* and *Resinous Extracts*. Thus the *Resins* of Jalap, Scammony, &c. are called *Magisteries*.

Mr. Boyle takes the true Notion of a *Magistry* to be a Preparation of Body (not an Analysis of it, for the Principles are not separated) whereby the whole, or very near the whole of it, by some Additament, is turned into a Body of a different kind; as when Iron or Copper is turned into Chrystals of Mars or Venus, &c.

The Canting Alchymists talk also of the *Magistry* of the *Philosopher's Stone*, which will be worth enquiring into, when they will tell us what the Stone it self is. For an Instance how they are made, I will mention two or three.

Magistry of Bismuth, is made by dissolving the Bismuth in Spirit of Nitre, and pouring upon it Salt-water, which will precipitate the *Magistry* to the bottom in a white Powder.

Magistry of Lead, is made by dissolving *Saccharum Saturni* in distilled Vinegar; and then precipitating it with Oyl of Tartar, made *per deliquium*.

Magistry or *Resine of Scammony*, *Jalap*, *Turbith*, &c. is made by a Dissolution of the Matter in Spirit of Wine; and then precipitating it by common Water, or Water impregnated with a little Alum. And after these manners are most other *Magisteries* made.

MAGISTERY of Tartar. See *Tartar Vitriolac*.

MAGMA, signifies the Dregs that are left after the straining of Juices.

MAGNA Assisa eligenda, is a Writ directed to the Sheriff, to summon four Lawful Knights before the Justices of Assize, there upon their Oath to chuse twelve Knights of the Vicinage, &c. to pass upon the Great Assize between A. Plaintiff, and B Defendant, &c.

MAGNA Charta, was granted the Ninth Year of Henry the Third, and confirmed by Edward the First. The Reason why it is termed *Magna Charta*, was either for that it contain'd the Sum

of all the Liberties of England, or else because there was another Charter, called *Charta de Foresta*, establish'd with it, which was the less of the two; or because it contained more than many other Charters, or more than that of King Henry the First, or of the great and remarkable Solemnity in the denouncing Excommunication, and direful Anathema's against the Infringers of it. *Holinshed* tells us, That King John, to appease his Barons, yielded to Laws or Articles of Government, much like to this Great Charter; but we have now no ancient Law written than this, which was thought to be so beneficial to the Subject, and a Law of so great Equity, in comparison of those which were formerly in use, that King Henry for the granting of it, had the Fifteenth Penny of all the moveable Goods, of both Temporality and Spirituality.

MAGNESIA Opalina, is a kind of *Crocus Metallorum*, or Liver of Antimony, but of a redder or more Opaline Colour than the common one. 'Tis made after the common manner, with equal Parts of Antimony, Salt-peter, and Sea Salt decrepitated. 'Tis less Emericke than the common one, because the Sea Salt fixes some of the active Sulphurs of the Antimony, and locks them up.

MAGNET, or Loadstone, is a Fossile approaching to the Nature of Iron-Oar, and endowed with the Property of attracting Iron, and of both pointing it self, and also inabling a Needle touch'd upon it, and then poised, to point towards the Poles of the World.

MAGNET. *Sturnius* in his *Epistola Inviatoria* Dat. Aitof. 1682. observes, That the attractive Quality of the Magnet hath been taken Notice of beyond all History: But that it was our Countryman Roger Bacon, who first discovered the Verity of it, or its Property of pointing towards the Pole, and this about 400 Years since. The Italians first discovered, that it would communicate this Virtue to Steel or Iron. The various Declination of the Needle, under different Meridians, was first discovered by *Sebastian Cabott*; and its Inclination to the nearer Pole by our Countryman *Robert Norman*. The Variation of the Declination, so that 'tis not always the same in one and the same place, he observes, was taken Notice of but a few Years before, by *Hewelius*, *Auzout*, *Petit*, *Volkamer* and others.

The Properties, or Phænomena, of this Wonderful Stone, as they have been discovered by Gilbert, Kircher, Cabeus, Des Cartes, and others, are these:

1. That in every Magnet there are two Poles, one pointing North, the other South; and if a Stone be cut or broken into never so many pieces, there are these two Poles in each piece.

2. That these Poles in divers Parts of the Globe, are diversely inclined towards the Earth's Centre.

3. That these Poles, tho' contrary to one another, do help mutually toward the Magnet's Attraction and Suspension of Iron.

4. If two Magnets are Spherical, one will turn or conform it self to the other, so as either of them would do to the Earth; and that after they have so conformed or turned themselves, they endeavour to approach to join each other; but if placed in a contrary Position, they avoid each other.

5. If a Magnet be cut thro' the Axis, the Parts or Segments of the Stone, which before were joined, will now avoid and fly each other.

6. If the Magnet be cut by a Section perpendicular to its Axis, the two Points which before were conjoined, will become contrary Poles, one in one, the other in the other Segment.

7. Iron receives Virtue from the Magnet by Application to it, or barely from an Approach near it, though it doth not touch it; and the Iron receives this Virtue variously, according to the Parts of the Stone 'tis made to touch, or made approach to.

8. If an Oblong piece of Iron be any how applied to the Stone, it receives Virtue from it only as to its Length.

9. The Magnet loses none of its own Virtue by communicating any to the Iron, and this Virtue it can communicate to Iron very speedily; tho' the longer the Iron touches or joins the Stone, the longer will its communicated Virtue hold; and a better Magnet will communicate more of it and sooner, than one not so good.

10. That Steel receives Virtue from the Magnet better than Iron.

11. A Needle touch'd by a Magnet, will turn its Ends the same way towards the Poles of the World, as the Magnet will do it.

12. That neither Loadstone nor Needles touch'd by it, do conform their Poles exactly to those of the World, but have usually some Variation from them: And this Variation is different in divers Places, and at divers Times, in the same Place.

13. That a Loadstone will take up much more Iron when arm'd or cap'd, than it can alone: And that tho' an Iron Ring or Key be suspended by the Loadstone, yet the Magnetical Particles do not hinder that Ring or Key from turning round any way either to the Right or Left.

14. That the Force of a Loadstone may be variously increased or lessened, by the various Application of Iron, or another Loadstone to it.

15. That a strong Magnet, at the least Distance from a lesser or a weaker, cannot draw to it a piece of Iron adhering actually to such lesser or weaker Stone; but if it come to touch it, it can draw it from the other: But a weaker Magnet, or even a little piece of Iron, can draw away or separate a piece of Iron contiguous to a greater or stronger Loadstone.

16. That in our North Parts of the World, the South Pole of a Loadstone will raise up more Iron than the North Pole.

17. That a Plate of Iron only, but no other Body interposed, can impede the Operation of the Loadstone, either as to its Attractive or Directive Quality. Mr. Boyle found it true in Glasses sealed Hermetically; and Glass is a Body as impervious as most are, to any Effluvia.

18. That the Power or Virtue of a Loadstone may be impaired by lying long in a wrong Position, as also by Rust, Wet, &c. and may be quite destroyed by Fire.

EXPERIMENTS of the Nature and Properties of the MAGNET.

1. Mr. Boyle found, that by heating a Magnet red hot, it could be speedily deprived of its Attractive Quality.

2. If a Loadstone be heated red hot, and then cooled either with its South Pole to the North, in a Horizontal Position, or with its South Pole downwards in a Perpendicular one, it will change its Polarity, the South Pole becoming the Northern one, and *vice versa*.

3. By applying the Poles of a very small Fragment of a Loadstone, to the opposite vigorous ones of a good larger Magnet, Mr. Boyle found he could speedily change the Poles of the Fragment; but he could not effect it in a Fragment that was considerably bigger, tho' he tried many Hours.

4. He observed, That well-temper'd and harden'd Iron Tools, when heated by Attrition, Turning, Filing, &c. they would, while warm, attract thin Filings, or Chips of Iron and Steel, but not when cold. Yet I remember once to have seen my self, and tried, that a Piece of a File, which was in the Hands of Mr. Yarwell the Spectacle-maker, did retain such an Attractive Quality, that it would take up, and keep suspended, the Key of a Cabinet, or *Escrivoire*, and needed no Attrition to excite this Magnetical Virtue.

5. The Iron Bars of Windows, which have long stood in an erect Position, do grow permanently Magnetical, the lower Ends of such Bars being the North Poles, and the upper the Southern: For according to the Laws of *Magnetism*, we find the lower Ends of such Bars will drive away the North End of a poised Needle, and will attract the Southern; which shews, that by the continual Passage of the Subtile Magnetical Particles thro' them, they are turned into a kind of Magnet themselves.

6. If a Bar of Iron that hath not long stood in an erected Posture, be only held Perpendicularly, its lower End will be the North Pole, and attract the South Point of a Touch'd Needle: But then this Virtue is transient, and will shift as you invert the Bar, for the other End when held lowermost, will presently become the North Pole; wherefore, in order to render the Quality of Verticity permanent in an Iron Bar, it must remain a long time in a proper Position. But the Fire will produce this Effect in a very short time; for as it will immediately deprive a Loadstone of its Attractive Power, or change its Poles, (as in *Exper. 1. 2.*) so it will as soon give a Verticity to a Bar of Iron, if being heated red hot, it be cooled in an erect Position, or directly North and South. Nay, it hath been observed often, that even Tongs and Fire-forks, by being often heated, and then set to cool in a Position near to erect, have gained this Magnetical Property.

The Reason of which very different Effects of the Fire on a Magnet, and on Iron, Mr. Boyle, with his usual Modesty, suggests to be this: That the peculiar Texture or Constitution by which a Magnet differs from common Iron Ore, being accurate and fine, is spoiled by the rude and violent Attacks of the Fire: But this mighty Agent, by working upon Iron, softens and opens the Pores of the Metal (which is harder than Iron Ore); so that it becomes capable of being pervaded by the Magnetical Particles, and by that means gains a Vertical Quality.

7. Mr. Boyle found that by heating a Piece of English Oker red hot, and placing it to cool in a proper Posture, it plainly gained a Magnetick Power.

8. The same Noble Gentleman found, that an excellent Loadstone of his own, having lain almost a Year in an inconvenient Posture, had its Virtue so impaired, that he at first thought some Body had got at it, and spoiled it by Fire.

9. If a Needle be well touch'd on a good Loadstone, 'tis known it will, when duly poised, point North and South; but if it have one contrary Touch of the same Stone, it will immediately be deprived of that Faculty; and by another such Touch, it will have its Poles quite changed; so that the End which before pointed North, shall now point Southward.

10. Dr. Power and Mr. Boyle both tried, that after a red-hot Iron had gain'd a Verticity, by being well heated and cooled North and South; and then also hammer'd at the Ends, this Virtue would immediately be destroyed by two or three Blows of a strong Hammer smartly given about the middle of it.

11. Mr. Boyle found by drawing the Back of a Knife, or long Piece of Steel Wire, &c. over the Pole of a Loadstone leisurely, once or divers times, beginning the Motion from the Equator or middle of the Stone, towards the Pole, the Knife or Wire will accordingly attract one End of a poised Magnetical Needle; but if you take another Knife or Wire, and thrust it leisurely over the Pole, from the Pole towards the Equator or middle of the Equator, this Knife shall expel or drive away the same End of the Needle, which the former Knife would attract: Which Experiment makes it very probable, that the Operation of the Magnet depends on the Flux of some fine Particles, which go out at one Pole, then round about, and in again at the other.

12. Because it is one of the Universal Laws of Nature, That *Action and Reaction are always equal*: Therefore 'tis plain, the Iron must attract the Magnet, as much as that doth the Iron: And so you may easily experiment it to be in Fact, if you place a Magnet or Piece of Iron on a Piece of Cork, so as that it may swim freely in the Water; for then you will see, that which soever you hold in your Hand, will draw the other towards it.

From all which Experiments, 'tis plain (as Mr. Boyle concludes) That *Magnetism doth much depend upon Mechanical Principles*. As also, That there is such a Thing as the *Magnetism of the Earth*; or that there are *Magnetical Particles*, which continually are passing from Pole to Pole; but Sir Isaac Newton demonstrates, that Gravity is a very different Thing from Magnetism; since the former is always as the Quantity of Matter attracted, but Magnetism by no means so.

Mr. Joblot, Professor of the Mathematicks in the French Academy of Painting, &c. hath found out (as it is said) a Method of making Artificial Magnets.

MAGNETISM, or *Magnetical Attraction*, or, as some are pleas'd to call it, *Coition*; is effected (say they) by the *Effluvia* of each Body, which drive away the Air between the Iron and the Stone; so that an Union of the Stone and the Iron is occasion'd by the joint Protrusion or Pulsion of the Air behind each.

But this Opinion is plainly refuted by Mr. Boyle's Experiment of a Loadstone's being equally Vigorous and Attractive in the exhausted Receiver, as in the open Air.

MAGNETICAL Amplitude, is an Arch of the Horizon, contain'd between the Sun at his Rising or Setting; and the East and West Point of the Compaſs: Or it is the different Riſing or Setting of the Sun from the Eaſt or Weſt Pointes of the Compaſs; and is found by obſerving the Sun at his Riſing or Setting, by an *Amplitude Compaſs*.

MAGNETICAL Azimuth, is an Arch of the Horizon, contained between the Sun's *Azimuth Circle*, and the *Magnetical Meridian*: Or it is the apparent Diſtance of the Sun from the North or South Point of the Compaſs; and may be found by obſerving the Sun with an *Azimuth Compaſs*, when he is about 10 or 15 Degrees high, either in the Forenoon or Afternoon.

MAGNETICAL Meridian; See *Meridian*.

MAGNIFIE, is a Word uſed chiefly in reference to *Microscopes*; which are uſually ſaid to *magnifie* Objects, or to make them appear bigger than they really are.

But in reality, *Microscopes* do not, nor can at all *magnifie* any Object, but only ſhew more of it to the Eye than before was taken Notice of; as will be apparent from the following Conſiderations.

For, Firſt, 'Tis clear that the Images of all Objects which are represented or pictured on the *Retina* in the Bottom of our Eyes, (and by which way all Viſion is made) thoſe Images, I ſay, muſt of neceſſity be very ſmall, in Proportion to the Objects themſelves; as is demonſtrable to any one's Reaſon, that will conſider the Smallneſs of the *Fundus Oculi*; and to his Senſes, that will but take the Pains to try the *Carteſian* Experiment, of putting a Bullock's Eye in the Hole of a darkned Room. (Vid. *Cart. Diopt.* cap. 5.) Now there being no Reaſon to ſuppoſe, that the bare Communication of that Picture to the Brain by the Optick Nerve, or Animal Spirits, can *magnifie* it again, ſo as to equal it with the Objects themſelves; it muſt and doth follow, that we always have Things represented to us leſs than they are, in the common way of Viſion.

2. At any conſiderable Diſtance we ſee but very little of the Object we behold, in Compariſon of what evades our Sight; and the nearer we come to it, the more ſtill we diſcover of it; and whenever we look in groſs upon an Object, our Eye cannot take Notice of many minute Differences, which, when we come to obſerve them ſingly, do yet very plainly appear; and after the neareſt View we can make with our bare Eye, very many Parts will yet remain undiscoverable to us: So that all that the *Microscope* doth, is (by taking off the Circular Radiation of Light) to direct our Eye to contemplate theſe minute Parts diſtinctly, ſingly, or by themſelves, which before we could either but confuſedly, or not at all, diſcern; and which now appearing (our Eyes thus armed with a Glaſs) very plain to us, make us attribute a new Magnitude to the Body we look on, becauſe we cannot imagine it can have thoſe Parts (which we now ſo diſtinctly ſee, and which before we could not ſee) unleſs its viſible Parts lie farther aſunder from each other than they did before, to make Room for theſe new to come between them.

3. But 'tis yet farther plain, that 'tis impoſſible any Glaſs can *magnifie* an Object, or make it

bigger to us than it really is in it ſelf: For to do this, muſt be to give it new Parts, and to remove the viſible Parts it hath already to a greater Diſtance from each other; both which are utterly impoſſible.

4. If you make a very ſmall Hole in a Piece of Tin or Braſs, and look thro' it on any Object, it will make it appear much bigger than before, and ſo much bigger as the Hole is leſſer; which plainly proves, that the Reaſon of any Object's appearing bigger thro' a *Microscope* is, as before, only bringing the Object nearer to the Eye, and letting ſome Parts of it be ſeen, which before were not diſcoverable by the bare Eye.

MAIM, or *Mayhim*, in Common Law, ſignifies a Corporeal Hurt, by which a Man loſeth the Uſe of any Member that is or might be of any Defence to him in Battel. But the cutting off an Ear, or Noſe, the breaking of the hinder Teeth, or ſuch like, is no *Maim*; and rather a Deformity of the Body, than diminiſhing of Strength: Yet cutting off a Noſe, or cutting or diſabling any Limb or Member, is Felony without Benefit of the Clergy.

Maim is commonly tryed by the Juſtices inſpecting the Party; and if they doubt whether it be a *Maim*, or not, they uſe to take the Opinion of ſome able Surgeon.

MAIN-Maſt of a Ship, is a long, large, and round Piece of Timber, ſtanding upright in her Middle or Waſt, on which is born her *Main-Yard*, and *Main-Sail*. Its Length is uſually $2\frac{1}{2}$ of the Length of the Mid-ſhip Beam.

MAIN-TOP-Maſt, is one half of the Length of the *Main-maſt*; and the *Top-gallant-maſt* half the Length of the *Main-top-maſt*.

MAINOUR, *Manour*, or *Meinour*, in a Legal Senſe, ſignifieth a Thing that a Thief taketh away, or ſtealeth: As to be taken with the *Mainour*, is to be taken with the Thing ſtollen about him.

MAINPERNABLE, is he that may be let to Bail. See the Statute of *Weſtm. 1. cap. 15.* made Anno 3. E. 1. what Perſons be *mainpernable*, and what not.

MAINPERNORS, are thoſe Perſons to whom a Perſon is delivered out of Cuſtody or Priſon, and they become Security for him, either for Appearance, or Satisfaction. They are called *Manu captores*, becauſe they do as it were *manu capere & ducere captivum à cuſtodia vel priſona*: And the Priſoner is ſaid to be delivered to *Bail*, from the Words of the *Bail-piece*, viz. *A. B. &c. traditur in Ballium J. D. & R. R. &c.*

MAINPRISE, in our Law, ſignifies the taking or receiving a Man into Friendly Cuſtody, that otherwiſe is or might be committed to Priſon, upon Security given for his Forth-coming at a Day aſſigned: And they that thus undertake for any, are called *Mainperners*, (which ſee) becauſe they receive him into their Hands; whence alſo comes the Word *Mainpernable*, denoting him that may be thus bail'd: For in many Caſes a Man is not *mainpernable*; whereof ſee *Bro. Tit. mainpriſe per totum*; and *F. N. B. fol. 249.* When *Mainpriſes* may be granted, and when not, ſee *Crompt. Juſtice of Peace*, fol. 136, and 141. And the *Mirror of Juſtices* ſays, That *Pledges* be thoſe that Bail or Redeem any Thing but the Body of the Man; but *Mainperners* are thoſe that free the Body of a Man; and therefore that *Pledges* belong properly

to real and mix'd Actions, and *Mainpernors* to personal.

MAINTAINOR, is he that supports or seconds a Cause depending in Suit between others, either by disbursing Money, or making Friends for either Party, towards his Help.

MAINTENANCE, is a Law-Term, signifying the Act of a *Maintainer*, when he seconds a Cause depending between others: And when it is accounted *Maintenance*, and when not, see *Broke Tit. Maintenance*. The Writ that lies against a Man for this Offence, is also called *Maintenance*.

MAJOR-General, is an Officer in an Army, that receives the General's Orders, and delivers them out to the Majors of the Brigades, with whom he consults what Troops are to mount the Guard, what to go out upon Parties, what to form Detachments, or to be sent on Convoys, &c. 'Tis his Business also to view the Ground to incamp on, and he is next subordinate to the General and Lieutenant-General.

MAJOR of a Brigade, either of Horse or Foot, is he that receives Orders, and the Word, from the Major-General, and gives them to the particular Majors of each Regiment. And the

MAJOR of a Regiment, is an Officer whose Business it is to convey all Orders to the Regiment; to draw it up, and to exercise it; to see it march in good Order, to look to its Quarters, and to rally it, if it happen to be broken in an Engagement, &c. He is the only Officer in a Regiment of Foot, that is allowed to be on Horseback in Time of Service; but he is mounted, that he may speedily get from Place to Place, as Occasion serves. There is also in a Garrison an Officer next to the Deputy-Governor, which is called the *Town*.

MAJOR; He ought to understand Fortification, and hath Charge of the Guards, Rounds, Parroilles and Sentinels.

MAJUS-Fus, is a Writ or Proceeding in some Customary Manors, in order to a Tryal of Right of Land.

MAKE; a Word frequently used by Lawyers, signifying, to Perform or Execute: As, to *make his Law*, is to perform that Law which he hath formerly bound himself to; that is, to clear himself of an Action commenced against him by his Oath, and the Oaths of his Neighbours. To *make Services or Customs*, is nothing else but to perform them; and to *make Oath*, is to take Oath.

MALACIA, is a depraved Appetite, which covets those Things which are not fit to be eaten; also a Tenderness of Body. *Blanchard*.

MALACTICA, or *Emollientia*, are Things which soften the Parts by a moderate Heat and Moisture, by dissolving some of them, and dissipating others. *Blanchard*.

MALAGMA, the same with *Cataplasin*; also 'tis used in the same Sense as *Malactica*.

MALIGNUS Morbus, a malignant Disease, is that which rages more vehemently and continues longer than its Nature usually permits it to do; as a Pestilential Fever, &c.

MALLEABLE, that which will bear being hammered, and spread, being beaten. This Quality belongs in the highest Degree to Gold, which is the most *ductile* or *malleable* of any Metal whatever. Mr. Boyle reckons the Qualifications requisite to Malleableness, to be, Having the Corpuscles, or Particles of such an adapted Size, Shape, and

Figure, whether hooked, branched, &c. that they can take fast hold of one another, and stick so close, as to make the Body spread easily under the Hammer, and not break nor crack.

MALLEUS, is one of the Four little Bones in the Ear.

MALLEOLUS, or *Malleus Pedis*, is Two-fold: *External*, which is the lower Process at the Foot of the Bone of the Leg, called *Fibula*; or *Internal*, which is the lower Process of the Bone of the Leg, called *Tibia*: These make up or form the Ankle.

Malleolus is also used as a Term in Botany, for a Sprout that grows out of a Branch which grew out its self but the Year before. *Columella*.

MALTHACODE, is a Medicine softened with Wax. *Blanchard*.

MALUM Mortuum, the Dead Discase, is a sort of Scab; so called, because it makes the Body appear black and mortified. It is in Colour black, and inclining to blue, and appears with a Crusty sort of Pimples, unseemly, and filthy, but without sending out Matter, or giving the Patient Pain. It infects the Hips and Legs especially. *Blanchard*.

MAMILLARY Artery, or the *Mammaria*, is a Branch of the Arteries which supplies the Breasts, and issues out of the adjoining Trunk of the *Aorta*, as some say; but more properly it ought to be said to come from the superior Part of the Subclavian Branch of the Ascending Trunk of the *Aorta*.

MAMMA, *Mammilla*, *Uber*, the Breasts, Dugs, &c. The *Grammarians* call the inner Part *Uvera*, and the outward Protuberances *Mamme*. The Substance of the Breasts is a white and soft Body, consisting internally of a Congeries of Conglomerated Glandules, by the means whereof the Milk is separated from the Arterious Blood, and is conveyed out by very little Pipes, which pass thro' the Nipples.

MAMMARY Vessels, are the Arteries and Veins that run through the Muscles and Glands of the Breasts.

MAMMIFORMES Processus, are the two Apophyses of the Bone of the back-part of the Skull.

MANDAMUS, is a Writ that lieth after the Year and Day; whereas in the mean Time the Writ called *Diem clausit extremum* hath not been sent out to the Escheator for the same Purpose to which it should have been sent forth. See *Diem clausit extremum*.

Mandamus is also a Charge to the Sheriff, to take into the King's Hands all the Lands and Tenements of the King's Widow, that against her Oath formerly given, marryeth without the King's Consent.

MANDATE, is a Commandment of the King, or his Justices, to have any thing done for Dispatch of Justice; whereof you shall see Diversity in the Table of the *Registar Judicial verbo Mandatum*.

MANDATARY, in Law, is he to whom a Charge or Commandment is given: Also he that obtains a Benefice by *Mandamus*.

MANDIBULA, or rather *Maxilla*, the Jaw; is either *Upper* or *Lower*. The *Upper Mandible* consists of Twelve Bones, on each Side Six. The First is at the external Corner of the Eye, which joyned with the Fore-process of the Bone of the Temples, produces the *Jugal Bone*. The Second constitutes

constitutes the inner Corner of the Eye, has a large Passage in it, by which the super-abundant Moisture of the Eye descends to the Nostrils. The Third is within the Circle of the Eye, interposed betwixt the other two. The Fourth, the greatest of all, forms the greatest Part of the Cheeks and the Palate, and is elaborately contrived with proper Cavities for the Reception of the Teeth. The Fifth helps to make the Nose. The Sixth, with another Bone along with it, terminates the Extremity of the Palate. And all those are joyned rather by a plain Line, than by Sutures. The Lower Jaw, at riper Years, grows into one continued Bone, extreme hard and thick, and consequently very strong: It has two Processes, one Acute, called *Corone*; the other in the Form of a little Head, called *Condylus*. It has two Holes within, and as many without, which make way for the Nerves: The Under Teeth are implanted in it, and is joyned with the inner side of the Bone of the Temples, called *Os petrosum*. To these Twelve Bones, *Colubus* and *Laurentius* are for adding a Thirteenth, which, they say, lies between the innermost Space and the *Os sphaeroides*, dividing the most inward Part of the Nostrils into two Parts, like a *Septum*; and therefore they call it *Vomer*. To these *B. Vesalius* would have the *Ossa spongiosa*, which are in the innermost Cavity of the Nose, to be added also.

MANGER in a Ship, is a Circular Place made with Planks fastened on the Deck, right under the *Hawfs*, being about a Foot and half in Height: The Use of which is to catch and receive the Sea-water, beating in at the *Hawfs* in a Strefs of Weather.

MANIA, a sort of Madness, is a Deprivation of Imagination and Judgment, with great Rage and Anger, but without a Fever; altho' a Fever may be joyned with a *Mania* proceeding from some other Cause.

MANICA *Hypocratis*, or *Hypocrates his Sleeve*, is a Woollen Sack or Bag, in Form of a Pyramid; wherewith *Aromatick* Wines, Medicines, and many other Liquors are streined. 'Tis so called by the Chymists.

MANIPULUS, is a Dry Measure, usual with Physicians in their Prescriptions: For it is a determinate Quantity, to wit, as much as can be held in one Hand, meant for the most part of Herbs.

Fasciculus is a different Quantity from

Manipulus, an Handful; for it properly signifies an Armful.

MANNER, a Word now much in Use, which we have borrowed from the French *Maniere*. In Painting, it signifies the Usage, Way, Mode, or *Manner* any Painter hath acquired, not only in the Management of his Hand or Pencil, but also as to his Observance of the Three principal Parts of Painting, *Invention*, *Design*, and *Colour*: And according as any one hath gotten a Habit or peculiar Way of Painting, we say, He has such a *Manner*. If it be agreeable to the Rules of this Art, Natural, Strong, Easy, and Duly Proportioned, we say, 'Tis a *Good manner*; and if the contrary, A *Bad manner*. If he imitate any famous Ancient Painter, as *Mich. Angelo*, *Raphael*, &c. we say, He *paints after their manner*. So 'tis also in Sculpture; and now adays in *Singing*, or *Playing* on any Instrument: When we would express our Approbation of any one's Way of *Singing* or *Playing*, we say, He *hath a very Good manner*.

MANNOPUS, a Term in the Common Law, signifying Goods taken in the Hand of an apprehended Thief.

MANOR, was a Noble sort of Fee granted partly to Tenants for certain Services to be performed, and partly reserved to the Use of the Family, with Jurisdiction over his Tenants for their Farms: The whole Fee was termed a *Lordship*, of Old a *Barony*; from whence the Court, that is always an Appendant to the *Manor*, is called, The *Court-Baron*. Now a *Manor* rather signifies the Jurisdiction and Royalty incorporeal, than the Land or Site: For a Man may have a *Manor in gross*, that is, the Right and Interest of a Court-Baron, with the Perquisites thereunto belonging; and another, or others, have every Foot of the Land. But at this Day a *Manor* cannot be made, because a *Court-Baron* cannot now be made, and a *Manor* cannot be without a *Court-Baron*.

MAN-SLAUGHTER, is the unlawful Killing of a Man, without prepened Malice: As when Two, that formerly meant no Harm one to another, meet together, and upon some sudden Occasion falling out, the one killeth the other. It differeth from *Murder*, because it is not done with foregoing Malice; and from *Chance-medley*, because it hath a present Intent to kill. And this is Felony, but admitted to the Benefit of the Clergy for the first Time.

MANTELETS, in Fortification, are a kind of movable Pent-houses, and are made of Pieces of Timber saw'd into Planks; which being about three Inches thick, are nail'd one over another to the Height of almost six Foot. They are generally cased with Tin, and set upon little Wheels, so that in a Siege they may be driven before the Pioneers, and serve as Blinds, to shelter them from the Enemies Small-shot. There are also other Sorts of *Mantelets*, cover'd on the Top, whereof the Miners make use to approach the Walls of a Town or Castle.

MANTLE, in *Heraldry*, is that Appearance of the Foldings of Cloth, Flourishing or Drapery, that is, in any Achievement, drawn about a Coat of Arms: 'Tis supposed to have formerly been the Representation of a Mantle of State in Blazon; 'tis always said to be doubled, *i. e.* Lined throughout with one of the Furs, as Ermin, Pean, Very, &c.

MANUCAPTIO, is a Writ that lies for a Man, who taken upon Suspicion of Felony, and offering sufficient Bail for his Appearance, cannot be admitted thereto by the Sheriff, or other having Power to let to *Mainprize*.

MANUS Christi, is a sort of Refined Sugar, so called, because it is put into Cordials for very weak People. *Blanchard*.

MANUTENENTIA, is a Writ used in case of Maintenance. See *Maintenance*.

MAP, is a Description of the Earth, or some particular Part thereof, projected upon a plain Superficies; describing the Form of Countries, Rivers, Situation of Cities, Hills, Woods, and other Remarks.

MARASMODES, is the Term for a Fever, which at last ends in a Consumption.

MARCHASITE, is the General Term for a Mineral Body, having in it some Metalline Parts; tho' many of them hold but a very little Quantity of Metal. See *Fossils*.

MARINE Barometer. See *Barometer*.

MARISCA, the same that *Ficus*.

MARI-

MARITAGIO *amisso per defaultam*, is a Writ for the Tenant in *Frank-marriage*, to recover Lands, &c. whereof he is divorced by another.

MARITAGIO *Forisfacto*. See *Forfeiture of Marriage*.

MARLINE, is a small Line made of Hemp untwisted, that it may be the more gentle and pliable; its use is to *seize* the ends of Ropes from *farcing out*: They use it also to seize the Straps at the Arle (as they call it) or lower end of the Block. *Marling a Sail*; is, when being so ript out of the *Bolt Rope*, that it cannot be sewed in again, the Sail is fasten'd by *Marline*, put thro' the Eye-let Holes made in it for that Purpose unto the *Bolt Rope*.

MARLINE Spikes, are small Spikes of Iron made for the Splicing together of small Ropes; and also to open the Bolt Ropes when the Sails are sewed into them. They are only a kind of small *Fidd*; which see.

MARMORATA *Aurium*, Ear-wax, is a certain Excrement of the Ear, laid there in the Auditory Passage from the Openings of the Arteries, or Sweat out from the Cartilages.

MARROW. See *Medulla*.

MARSHAL: There be with us divers Officers of this Name; as *Lord or Earl Marshal of England*, whose Office consists chiefly in Matters of War and Arms, as well with us as in other Countries. Also, the *Marshal of the King's House*, whose special Authority is in the King's Palace to hear and determine all Pleas of the Crown, and to punish Faults committed within the Verge, and to hear and judge of Suits between those of the King's Household, &c. There be several other Officers of this Name, as *Marshal of the Justices in Eyre*; *Marshal of the King's Bench*, who hath the Custody of the King's Bench Prison in *Southwark*: *Marshal of the King's Hall*, whose Office is, when the Tables are prepared, to call out both those of the Household, and Strangers, according to their Worth, and decently to place them, &c. Also *Marshal of the Exchequer*, to whom the Court committeth the Custody of the King's Debtors during the Term-time, for securing the Debts: He also assigneth Sheriffs, Elcheators, Customers, and Collectors their Auditors, before whom they shall account.

MARSHALSEA, is the Court or Seat of the *Marshal of the King's Household*, who formerly perhaps used to sit there in Judgment, or keep his Prison; and is now allowed for the Prison in *Southwark*.

MARSUPIALIS *feu Bursalis*, is a Muscle of the Thigh, so called from its Tendons running through (as it were) a second fleshy Beginning of it self, which Duplication represents a Purse: It is also called *Obturator Internus*; it ariseth broad and fleshy, from that part of the *Os Ilium*, *Iscium*, *Pubis*, and Ligament that is extended in the Great Foramen of the two last named Bones internally, and marches tranversely in the *Sinus* of the *Iscium*, (fenced on each side by two Processes, the one Acute and the other Obtuse) where it is externally fleshy, but internally it hath three, sometimes four Tendons passing in so many distinct Furrows in the said *Sinus*, like so many Cords in a Quadruple Pulley, where it meets with the other fleshy beginning, commonly called its *Marsupium*, arising from the above-mentioned Acute and Obtuse Processes, which joining with the said Tendons at their united Insertion to the Superior part of the Root of the

great *Trochanter*, near the Implantation of the *Pyriformis*: When this Muscle acteth, its Insertion is directed towards that part of the *Iscium*, over which its Tendons run after the manner of a Pulley, and the *Os Femoris* is thereby turned outwards.

MARTIAL *Regulus of Antimony*. See *Regulus*. When any Particles are said to be of a *Martial Nature* in Chymistry or Natural Philosophy, 'tis meant, that they partake of the Nature of Iron or Steel. The Chymists calling Iron, *Mars*.

MARTIAL Law, is the Law of War, depending upon the King's Pleasure, or his Lieutenant: For the King in time of Peace, never makes any Laws, but by common Consent in Parliament, yet in War he useth absolute Power, inasmuch, that his Word is a Law; but even this Power hath of late Years been invested in the King, or his Generals of the Army by Act of Parliament, and under particular Restrictions too. Read the new Acts of Parliament for punishing Mutineers and Deserters, &c.

MARTLET, the Term in Heraldry for a Pidgeon, with its Feet erased or torn off; 'tis also the Difference, or mark of Distinction in an Escutcheon for the fourth Brother or Family.

MARTNETS in a Ship, are small Lines fastened to the *Leetch* of the Sail, being Reeved thro' a Block on the Topmast-head, and so they come down by the Mast to the Deck. Those *Martnets* which belong to the Top-sails are fastened (after the same way) to the Heads of the Top-gallant Masts, but their *Fall* comes down no farther than the Top, when it is haled: The Word is *Top the Martnets*; i. e. Haul them up. Their design is, in furling the Sail, to bring that part of the *Leetch* which is next the *Yard Arm*, close up to the Yard, that so the Sail may furl up the Closer.

MARS, the Name of one of the Planets which moves round the Sun in an Orbit between that of the Earth and *Jupiter*.

To view this Planet, there requires a good Telescope, with small Apertures on the Object-glass, or else his Glairy Light makes but a confused Appearance.

This Planet as (well as the rest) borrows its Light from the Sun; and has its Increase and Decrease of Light like the Moon; and it may be seen almost bisected when in his Quadratures with the Sun, or in his *Perigaeon*, but never corniculated or falcated as the other Inferiors.

March 10. 1665. Dr. Hook observed this Planet, with a 36 Foot Tube, and saw its Body as large very near as the Moon at Full; and in it he observed several Spots, and particularly a Triangular one; which having a Motion, he concluded the Planet to have a turbinated Motion round its Centre.

In the Year 1666, *February* the 6th in the Morning, Mr. Cassini with a 16 Foot Telescope, observed two dark Spots in the first Face of *Mars*, moving from 11 at Night until break of Day.

February the 24th in the Evening, he saw two other Spots in the other Face of this Planet, like those of the first, but much bigger: And continuing the Observations, he found the Spots of these two Faces to turn by little and little from East to West, and to return at the Space of 24 Hours, 40 Minutes, to the same situation, where in they were seen at first.

Whence he concluded, That the Revolution of this Planet round its Axis, is perform'd in the space

space of 24 Hours; 40 Minutes, or thereabouts.

The Distance of *Mars* from the Sun, is about one and an half of that of the Earth from the Sun; and therefore to an Eye placed in *Mars*, the Diameter of the Sun would appear by one and an half less than it doth to us, and consequently his Light and Heat will be but half of what it is here on our Earth; but this admits of a sensible Variation, because of the great Eccentricity of *Mars* his Orbit; yet not so great as in *Mercury*.

Mars his Year is almost twice as long as ours, and his *Natural Day* a little greater than ours; but his *Artificial Day*, or the Time in which the Sun appears above his Horizon (besides the Twilight before Sun-rise, and after Sun-set, according to the daily Height of the Atmosphere) is almost every where equal to his Night; and consequently, in one and the same place on his Surface, there can be but little Variety of Seasons as to Summer and Winter, &c. the Reason of which is, That the Axis of the Diurnal Revolution of this Planet, is nearly at Right Angles with the Plane of the Orbit. But Places situate in divers Latitudes, or at divers Distances from his Equator, will have very different Degrees of Heat, by reason of the different Inclination of the Sun's Rays to the Horizon; as is the Case of our Earth when the Sun is in the Equinoxes.

And from hence the Learned Dr. Gregory, in his *Astronom. Phys. & Geometr.* p. 473. conjectures very probably, That the *Fascia* of this Planet do arise: which are certain *Swathes* or *Fillets* which appear in *Mars*, and are posited parallel to his Equator. For since there is always in the same Climate (*here*) nearly the same Degree of Heat, 'tis likely, that these Spots in *Mars* owing their Original to Heat and Cold, (as in our Earth Clouds and Snow do) may be extended in the said Climates in Parallels to the Equator, or to the Circle of *Mars* his Diurnal Revolution, and so form the *Fascia*. And the same is true of *Jupiter*, which, as well as *Mars*, hath a perpetual Equinox.

That *Mars* hath an Atmosphere, like ours, is argued from the Phenomena of the Fixed Star's appearing obscur'd, and, as it were, extinct, when they are seen just by the Body of *Mars*: And if so, a Spectator in *Mars* will hardly ever see *Mercury*, unless it may be in the Sun, when that Planet passes over his Disk like a Spot, as he doth sometimes to us.

To an Eye in *Mars*, *Venus* will appear about as far from the Sun, as *Mercury* doth from him with us; and the Earth, as far as *Venus* appears to us, to be from the Sun. And when the Earth, being seen from *Mars*, appears in Conjunction with, and very near to the Sun, the *Martial* Spectator will see that which *Cassini* once or twice saw in *Venus*, viz. the lower Planet (or the Earth) appear horned or falcated; and its Satellite, the Moon of the same Figure, and at its greatest Distance, not above 15 minutes of a Degree from the Earth. *Greg. Astronom.*

MARSHAILING a Coat of Arms (in Heraldry) signifies the due and proper joining of several Coats of Arms in one and the same Shield or Escutcheon, together with their Ornaments, Parts and Appurtenances.



MASCLE, a Term in Heraldry for a Bearing of this Figure: Gules a Chevron Ermin between three *Masles* Argent, by the Name of Bellgrave. *Guillim* saith, the *Masle* represents the Mesh of a Net, and is an honourable Bearing. A *Masle* differs from a *Lozenge*, only by being voided.

MASSE: This Word is used by the Natural Philosophers to express the Quantity of Matter in any Body, and this Sir *Isaac Newton* saith, he found by most accurate Experiments on *Pendulums*, to be always proportionable to the Weight of Bodies, which is a good Argument to prove the Necessity of allowing a Diffeminate Vacuum.

MASSETERS, in Anatomy, are short, thick Tendinous Muscles of the Lower Jaw, produced forwards from the *O. Primum* of the Upper Jaw, and backwards from the *Jugal Bone*; they are connected to the Lower Jaw. They assist the *Temporales* to move it to the Right-side, Left-side, and forward, according to the various Disposition of the *Fibres*.

MASTER of the Rolls, is an Assistant to the Lord Chancellor, or Lord Keeper of the Great Seal of England, in the High Court of Chancery, and in his Absence, hears the Causes there, and giveth Orders. He is by some called *Clerk of the Rolls*. And he has the disposing of the Offices of the Six Clerks, Clerks of the Petty Bag, Examiners of the Court, and Clerks of the Chapel.

MASTERS of the Chancery, are Assistants in Chancery to the Lord Chancellor, or Lord Keeper of the Great Seal, in Matters of Judgment. Of these there are some Ordinary, some Extraordinary; of Ordinary there are Twelve, (whereof the *Master of the Rolls* is accounted one) whereof some sit in Court every Day in each Term, and have referred to them (at the Lord Chancellor, Lord Keeper, or Master of the Rolls Discretion) Interlocutory Orders for stating Accounts, computing Damages, and the like; taking of Oaths, Affidavits, and Acknowledgments of Deeds and Recognizances. The Extraordinary do act in all the Country Ten Miles from London, by taking Recognizances and Affidavits, Acknowledgment of Deeds, &c. for the Ease of the Subject.

MASTICATION, or Chewing, is an Action; whereby we break and divide the Meat into small Pieces with our Teeth, and mix it with the Spit or *Saliva*, in order to its being the more easily fermented, digested, and turned into Chyle in the Stomach.

MASTICATORIES, are Medicines which are designed to provoke Spitting. By some they are called *Apoplegmatics*.

MASTOIDEI, in Anatomy, is the same with *Mammillares*, and are such Processes any where, as are like Breasts or Dugs, which from a broad Basis, end in an obuse Top, and are shaped like the Teats in a Cows-Udder.

This Name is given by some Writers to those Muscles which bend the Head proceeding from the Neck-bone and the Breast-bone, terminating in the Process *Mammiformis*. These Muscles arise partly tendinous, and partly fleshy, from the Upper Part of the *O. Pectoris*, near half the Clavicle;

vicle; with two seemingly distinct Originations. Mr. Cowper saith, When either of these Muscles act, they turn the Face to the contrary side. The *Process*, or *Apophysis* of the *Os Temporale*, which is in Shape something like the Teats of a Cow, is called by this Name; and so are the Processes of the *Olfactory Nerves*.

MASTS of a Ship, are the Main-mast, Main-top-mast, Main-top-gallant-mast, Fore-mast, Fore-top-mast, Fore-top-gallant-mast, Mizzen-mast, and Mizzen-top-mast; amongst which, may also be reckoned her Bolt-sprit; all which see.

For the Proportion of Masts, Sir H. Manwaring gives these Rules. Whatever the Breadth of a Ship be in Feet, multiply $\frac{1}{4}$ of that Breadth by 30, the Product is the Length of her Main-mast in Yards. Thus if a Ship be 30 Foot at the *Midship-Beam*, $\frac{1}{4}$ of 30 is 24: Therefore that Ship's Main-mast must be 24 Yards, or 72 Feet in Length. Then for its Bigness, he allows an Inch to every Yard in Length; and therefore this Main-mast must be 24 Inches thro' or thick.

The Fore-mast of a Ship must be $\frac{2}{3}$ of the Length of the Main-mast, that is in this case, 19 Yards $\frac{2}{3}$, or 57 Feet $\frac{2}{3}$. Thick or through, it must be near 20 Inches.

The Bolt-sprit or Bow-sprit, is always the same Length and Bigness with the Fore-mast. And the Mizzen-mast must be just half the Length of the Main-mast, and half as thick.

MATER Dura, called also *Dura Meninx*, is a Membrane which sticks close to the Skull within, in some places, and mediately covers both the Brain and *Cerebellum*; it has four Cavities, which supply the Place of the Veins, and come together betwixt the Brain and *Cerebellum*, which Conjunction is called *Torcular*.

MATER Tenuis, or *Pia Meninx*, is a Membrane which immediately cloaths the Brain and *Cerebellum*; is extremely full of Sanguinary Vessels, and is design'd, as some think, to keep in the Spirits generated in the Brain and *Cerebellum*, that they fly not away.

MATERIA Medica, is whatever is used in the Art of Medicine for the Prevention or Cure of Diseases, whether collected or prepared from Plants, Animals, Minerals, &c. by Chymistry or Pharmacy.

MATHEMATICKS, originally signifies any Discipline or Learning (*μαθηματικα*) but now, 'tis properly that Science which teaches or contemplates whatever is capable of being numbered or measured, as it is computable or measurable.

And that Part of *Mathematicks* which relates to Number only, is call'd *Arithmetick*: That which relates to Measure in general, whether Length, Breadth, Motion, Force, &c. is called *Geometry*.

Mathematicks may be reckon'd either,

1. *Pure, Simple, or Abstracted*, which considers abstracted Quantity, without any relation to Matter, or Sensible Objects. Or,

2. *Mixt Mathematicks*, which is interwoven every where with Physical Considerations.

Mathematicks also are divided into

Speculative, which proposes only the simple Knowledge of the Thing propos'd, and the bare Contemplation of Truth or Falshood: And

Practical, which teaches how to demonstrate something useful, or to perform something that shall be propos'd for the Benefit and Advantage of Mankind.

MATHEMATICAL Horizon, is the same with *True Horizon*. See *Horizon*.



MATRASS, or *Bolt-head*, is a long frait-necked Vessel of Glas, frequently used by the Chymists in Distillations; and when they are fitted to the Nose of an Alembick, they are called *Receivers*, because they Receive the Matter which the Fire forces over the Helm or Head of the Still. They are of this Figure. And when one of these is by its Neck lured well into the Neck of another, they call it a Double Vessel, which is used for the Circulation of Spirits, and for the Opening or Subtilizing of any Body by a long Digestion.

MATRIX, the same that *Uterus*. **MATRIX** of a Tree or Plant, is the same with what the Botanists call *Cor*; which see.

MATTER, or *Body*, is an impenetrable, divisible, and passive Substance, extending into Length, Breadth and Thickness. This, when consider'd in general, remains the same in all the various Motions, Configurations and Changes of Natural Bodies, being capable of putting on all manner of Forms, and of moving according to all manner of Directions and Degrees of Velocity.

The Quantity of Matter in any Body, is its Measure, arising from the joint Consideration of the *Magnitude* and *Density* of that Body: As if any Body be twice as *dense* as another, and take up *twice the Space*, 'twill be four times as great. This Quantity of Matter is best discoverable by *Weight*, to which 'tis always proportionable; as the Excellent Sir *Isaac Newton*, by most accurate Observations on Pendulums, found true by Experience.

Dr. Woodward, in his *Essay towards a Natural History of the Earth*, Part 5, asserts Matter to be originally and really very different; being at its first Creation divided into several *Ranks, Sets or Kinds of Corpuscles*: That all the *Corpuscles* which are of the same *Kind or Set*, agree in every thing, and are most exactly like unto one another in all respects. But those that are of *different Kinds*, differ from one another every way, as well in *Matter or Substance*, in *Specifick Gravity*, in *Hardness*, in *Flexibility*, and in several other ways, as in *Bigness* and *Figure*. And he supposes, that from the various *Composures and Combinations* of these *Corpuscles* together, happen all the Varieties of the Bodies formed out of them; and all their Differences in Colour and outward Appearance, in Taste, in Smell, in Hardness, in Specifick Gravity, and in all other respects.

MATTER in Deed, and *Matter of Record*, are Terms in Law, which are said to differ thus: *Matter in Deed*, seems to be nothing else but a Truth to be proved, tho' not by any Record; and *Matter of Record* is that which may be proved by some Record. For Example: If a Man be sued to an *Exigent*, during the Time he was in the King's Wars; this is *Matter in Deed*, and not *Matter of Record*: And therefore he that will alledge this for himself, must come before the *scire facias*, before Execution be awarded against him; for after that, nothing will serve but *Matter of Record*; that is, some Error in the Process appearing upon Record.

MATTS on Board a Ship, are a kind of broad thick Clouts, wove out of spun Yarn, Sinner, or Thrums; and are used to preserve the Main and Fore-Yards from galling against the Masts at the Tyes, and at the Gunnel of the Loof: Also they serve to keep the Clew of the Sail from galling there; as also to save the Clews of the Fore-sail from doing so at the Beak-head and Bolt-sprit.

MATURITY, the just Ripeness of any Fruit; and by Analogy, the Arrival of any thing to its just Degree of Perfection.

MATURATION, is the Action of growing Ripe, or the Tendency of any Fruits towards Maturity or Ripeness.



MAUNCH: The Figure of an Ancient Sleeve of a Coat, is so called by the Heralds, and is born in many Gentlemen's Escutcheons; as in the Earl of Huntington's, in those of the Coniers, &c.

MAXILLA Superior, the Upper Jaw-bone: This constitutes the inferior and lateral Parts of the Orbit of the Eye, and comprehends also the Bones of the Nostrials, Palate, and Upper Row of Teeth. It hath, according to *Diemerbrook*, Twelve Bones belonging to it, Six on each side. The First is called the *Os Jugale*, and is of a Triangular Form, and posited at the External Angle of the Eye. The Second is called the *Foramen lacrymale*, and is a thin pellucid small Bone, placed in the Internal Angle of the Eye, and gives a Passage to that Liquor which makes the Tears. 'Tis near this *Foramen* that the *Abscesses*, which the *Greeks* call *Ægileps*, and we *Fistula lacrymalis*, usually happens. The Third is a thin pellucid Bone, placed between the two former, and within the Orbit of the Eye, and which is continued with the fungous Bones of the Nostrials. The Fourth is a large Bone, constituting the greatest Part of the Cheek and Palate, and receiving into it the Upper Teeth by their proper Cavens: It hath an eminent conspicuous *Foramen*, or Hole, placed under the Orbit of the Eye, and transmitting to the Face a Branch of the Third Pair of Nerves. It hath also another *Foramen* at the hinder part of the *Dentes incisivi*; and then there go up two *Foramina*, with a Bony Partition between them, one to each Nostril. The Fifth is a thin, hard, small, oblong Bone, approaching to a square Figure; and this, with its Partner on the other side, continues the Bridge, or protuberant Bone of the Nose. The Sixth Bone forms, with its Fellow, the Bony Part of the Palate, or Roof of the Mouth. *Fallopian*, *Columbus*, and some others, add to these a Thirteenth Bone, which they call *Vomer*, and place it between the Palate and *Os spheroides*; and will have it like a kind of *Septum*, to divide the Lower Parts of the Nostrials. And *Vesalius* reckons the Two *Ossa spongiosa* among these Bones of the Superior Maxilla.

MAXILLA Inferior, is the Lower or Moveable Jaw: This contains all the Lower Teeth. It hath two Processes on each side; of which, the Foremost is thin and large, and ends in a kind of Point, to which the Tendon of the Temporal Muscle is firmly knit, and this is called *Corona*: The other is obtuse, and lies more backwards, and is join'd by a Cartilage to the Neck; and its Part, by which it adheres, they call *Condylus*: It hath Four *Foramina* design'd to transmit the aforesaid Processes.

MAXIMIS and *Minimis*. The Mathematicians call that Method whereby a Problem is resolv'd, which requires the greatest or least Quantity attainable in that Case, *Methodus de Maximis & Minimis*.

Of this see *Hon. Faber*. at the End of his *Synopsis Geometrica*, where you have a great Variety of Problems of this kind. See also *Ozanam's* Preface to his *Dictionnaire Mathematique*; the *Marquess d'Hospital* his *Analyse des Infiniment Petits*, Sect. 3, &c. In the *Acta Erud. Lips.* A. D. 1683. p. 122. there is also a Method of determining *Maxima & Minima*, by one *D. T.* chiefly applicable to the Drawing of Tangents to Curves: And in the same Book, and for the Year 1684. p. 467. you have a Method of the famous *Mr. Leibnitz*, for the same Purpose, according to his *Calculus Differentialis*. See also the Seventh Book of *M. De La Hire's* *Conick Sections*, in Latin & Chap. 7. of *Niewentijt's* *Analysis Infinitorum*. There is also printed in the First Volume of *Des Cartes's* *Geometry*, a Method of *Huddes*, for finding the *Maxima & Minima*, p. 137.

The following Account of this Method, was communicated to me by *Mr. Humphrey Ditton*, a Person very Skilful in these Matters; and now Master of the New Mathematical School in *Christi's Hospital*.

PROBLEM.

To determine any Flowing Quantity in an Equation propos'd, to an Extreme Value.

Tho' there are various excellent Methods for the doing of this, yet there is nothing that seems so clear and natural, and is really so general, so quick and easie, as that which the Doctrine of Fluxions furnishes us withal.

To solve the Problem in any Case that can be propos'd, is only to make a just Application of this General Rule, viz.

Having put the Equation into Fluxions, let the Fluxion of that Quantity (whose Extreme Value is sought) be suppos'd = 0; by which means all those Members of the Equation in which it is found, will vanish, and the remaining ones will give the Determination of the Maximum or Minimum desired.

DEMONSTRATION.

Every Maximum or Minimum is in its own Nature a Stable Quantity: To determine therefore any Flowing Quantity to a Maximum or Minimum, is to make it (instead of a Flowing) a Permanent one; but the Fluxion of a Permanent Quantity is equal to Nothing. From whence the Reason of the Rule is sufficiently clear.

Let us illustrate this by some Examples. *Ex. gr.*

Suppose $bbx - yyyx + cyy - d^2 = 0$, where y and x are Flowing Quantities, and y is to be determined to an Extreme Value. Then

$$bbx - 2yyx - yyy + cyy + cxy = 0,$$

and making $y = 0$, $bbx - yyy + cyy = 0$, and $y - cy = b$, from which Quadratick Equation y may be determin'd.

Let

from thence the Lines FC , FE , FG be drawn to the Curve.

Let $AF = n$, AB , AD , $AH = x$, $HF = n + x$, BF , $FD = n - x$, ED , BC , $GH = y$, FC , FE , $FG = z$. The Point F being taken any where at liberty, 'tis evident, that when any Line, as FC , FG , &c. is coincident with FE , which I imagine to be a *Normal* to the Curve in the Point E , from the same Point F ; that then the intercepted Line, FB , FH , &c. is coincident with the *Subnormal* FD , and consequently upon the determining of an *Extremum*, the Invention of a *Tangent* naturally follows.

To form the General Equation that is to serve in this Business, we have, from the Rectangular Triangle FBC , $z^2 = n^2 - 2nx + x^2 + y^2$; or on the other side F , from the Triangle GHE , $z^2 = x^2 - 2nx + n^2 + y^2$; or for an *Extremum*, $2xx - 2nx + 2yy = 0$:

In which Equation, if in the room of $2yy$ we substitute its Value from the Equation of the Curve, the *Subnormal* will be discovered.

Ex. gr. Suppose the Curve were an *Hyper-*

bola, then $2yy = rx + \frac{2rxx}{q}$: Therefore

$$2xx - 2nx + rx + \frac{2rxx}{q} = 0, \text{ and } 2nx = 2xx + rx + \frac{2rxx}{q}$$

$$\text{and } n = x + \frac{r}{2}$$

$$\frac{rx}{q} = FA, \text{ wherefore } FD \text{ (the } \textit{Subnormal})$$

$$= \frac{r}{2} \frac{rx}{q} \text{ Q. E. I.}$$

Suppose the Curve a Circle, in which Case $2yy = 2rx - 2xx$; then proceeding as before, we have $2nx = 2rx$, and $n = r$, and therefore $FD = r - x$; which shews that F is ever in this Curve, the Centre it self. In the

Common *Parabola*, $rx = 2yy$, and therefore $n = \frac{r}{2} + x$, and so $FD = \frac{r}{2}$. But 'tis not only in these Conick Sections, but in any other Curve whatsoever, that from this general Equation by a due Substitution of the Value of $2yy$, the *Tangent*, or (which is all one in effect) the *Subnormal* will be discovered.

MEAN Axis, in *Opticks*. See *Axis*.

MEAN Diameter, in *Gauging*, is a Geometrical Mean between the Diameters at Head and Bung in any clofe Cask.

MEAN and Extream Proportion. See *Extream and Mean Proportion*.

MEAN in *Law*, signifies the Middle between two *Extreams*, and that either in Time or in Dignity. As in the First, His Action was *Mean* betwixt the Disselin made to him and his Recovery, that is in the *Interim*, (or, as we say, in the *mean time*.) Of the Second, there is *Lord-mean* or *mesne*, and *Tenant-mean*. See *Mesue*.

MEAN Motion, or *mean Longitude* of the Sun, in the *Ptolemaick Hypothesis*, is an Ark of the *Ecliptick*, reckon'd from the Beginning of *Aries* to the Line of the Sun's *Mean Motion*, accounting according to the Order of the Signs. And 'tis also not unusual to call the

MEAN Motion of the Sun, in the Old Astronomy, the Distance (accounted on in the *Ecliptick*, from the Beginning of *Aries*) of the Sun from the Line of his *Mean Motion*. See *Line of the Sun's Mean Motion*.

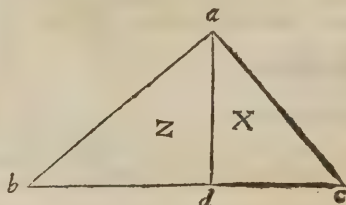
MEAN or *middle Proportional*, between any two Lines or Numbers, is that which hath the same *Proportion* to a third Term that the first bears to it.

Thus 8 is a *mean Proportional*, between 2 and 32, because $2 : 8 :: 8 : 32$. And the three Numbers in this Case are thus expressed $2.8.32 ::$ That is, Two, Eight, and Thirty two, are in *Continual Proportion*; for the same *Proportion* is continued from the Middle or Second Term to the Third, as was between the First and Second: Therefore 'tis the very same thing as if the middle Term had been put down twice. Now, because when Four Numbers are *Proportional*, the Rectangle of the middle Terms is equal to that of the *Extreams*, it must be so here: But here the two middle Terms being the same Number, they will make a Square; so that when Three Numbers are in *continual Proportion*, the Square of the middle Term is equal to the Rectangle of the *Extreams*; and that middle Term is call'd a *mean Proportional* between the other two.

PROPOSITION.

In a Right angled Triangle

The Perpendicular (ad) is a *mean Proportional* between the Segments of the Hypotenuse (bd and dc .)

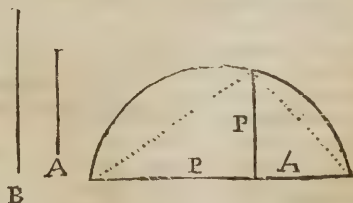


That is, as $bd : ad :: ad : dc$; and therefore the Square of ad is equal to the Rectangle between bd and dc .

For the Triangles cda and adb , being similar, 'twill be as $cd : da :: da : db$: and consequently $\square da = \square bdc$.

PROBLEM.

To find a Mean Proportional to Two Given Lines, A and B.

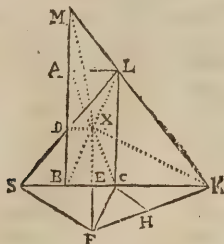


Put A and B both into one Line, then bisect the whole Line; make the Point of Bisection the Centre of a Semi-circle, and then erect the Line PP perpendicular to the Two given Lines, at their Point

For $B : P :: P : A$, by the last Proposition.

Multiply the Numbers into one another, and extract the Square Root of the Product : Of which see more under *Logarithms*, and the *Use of Logarithms*, Numb. 11. and 12.

This famous Problem (which is the same as the *Duplication of the Cube*) may be resolved and demonstrated by means of the Conchoid of *Nicomedes*; and would be Geometrical, if that were a Geometrical Curve.



DEMONSTRATION.

$$b \quad eb \quad :: \quad c. \quad \frac{ebc}{b} \text{ Or } e c$$

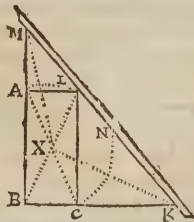
Wherefore $ec = CK$. Also $MA. AD :: SC. CK$
 $b. \frac{e \cdot b}{2} :: 2c. ec.$

(Because if you halve one Consequent, you must double the other Antecedent.) And $S.C. CK :: FH.HK$ (because CH is parallel to SF) Wherefore $MA.AD :: FH.HK$. HK is equal to AD or $\frac{1}{2}eb$ (as was taken above) wherefore FH must be equal to MA or b . And consequently $MD = FK$ (for both in this Notation are $b + \frac{1}{2}eb$) And the Square of each will be $bb + ebb + \frac{1}{4}eebb$, that is $= FE + \square EK$, (by 47 *e* 1. *Eucl.*) And to these Equal Quantities adding the Squares of DX and EC , each of which is $\frac{1}{2}ee$. Their Sum, *viz.* $\square MD + \square DX$ (*i.e.*

\square M X) will be $bb + ebb + \frac{1}{2}ecbb + \frac{1}{2}cc$,
 which also is equal to the Sum of these \square EF +
 \square EC (i. e. \square FC, which was = to A D +
 \square XE by the Construction + \square EK = $\frac{1}{2}ecbb$
 + $\frac{1}{2}cc + ecc + ecc$; that is equal to \square XK.
 Wherefore since the Squares are equal, the Roots
 or Line M X and X K must be equal to each
 other.

Now if from those equal Sums $bb + ebb + \frac{1}{4}eebb + \frac{1}{4}cc$, and $\frac{1}{4}eebb + \frac{1}{4}cc + ecc + eecc$, you take away what is common to both, *viz.* $\frac{1}{4}eebb + \frac{1}{4}cc$, there will remain $bb + ebb = ecc + eecc$: Which will be found to be also, singly taken, equal to each other; because the Part taken away bb , will be to the other Part taken away ecc : as the Remainder ebb , is to the Remainder $eecc$; and both must be as their Wholes were, *i.e.* equal: Wherefore $bb = ecc$, and $ebb = eecc$. Which latter Equation resolved into Proportionals will stand thus, as $eb.b : ec.c :: ec.c : CK$; or as $A.B : C.K :: C.K : M.A$. And if you resolve the former Equation, it will be as $ec.c : b.c :: b.c : CK$. That is $C.K : M.A :: M.A : B.C$. Which is in plain Words the Proposition, *viz.* that $C.K$ and $M.A$ are Two Mean Proportionals between $A.B$ and $B.C$. Q. *E.D.*

On which *Demonstration* is founded the Mechanical Way of *Eutocius*, *Lib. 2. De Sph. and Cyli.* for finding Two Mean Proportionals; which is thus:



Join the Given Lines A B and B C in a Right Angle, as before, and compleat the Rectangle, drawing the Diagonal to find the Point X, and producing B A and B C both ways towards M and K; for then fix a Ruler on the Centre L, and then return it forward and backward, till you find by the Compasses M X and X K are equal; and then A M and G K are the Lines sought.

Another Method for which, *Euclides* also mentions, which seems more practical; which is, To make a Semi-circle on A C the Diagonal of the Rectangle, then the Moveable Ruler is placed forwards and backwards till M (by the Compasses) be found equal to N K, and that will give the Points M and K, and consequently the Lines A M and C K required;

How to find Two *Mean Proportionals* by help of
of the *Cissoid* of *Diocles*; and by Two Parabolas,
(which was *Menecemus* his way) see *Sturmius Mathesis*
Enucleata, Book 2. Prop. 21. *Consect. & Scholium*.
Des Cartes doth the same Thing by help of
One Parabola only, see his *Geometrie*, p. 91. and
as many as you please by help of a Curve Line
generated after a peculiar way, which see in p
67, 68. of his *Geometrie*. Much more of this Na-
ture you have in *Slusius's Meisobolium*.

MEASURE, in Musick, is a Quantity of the Length and Shortness of Time, either with respect to Natural Sounds, pronounced by the Voice; or Artificial, drawn out of Musical Instruments: Which

Which Measure is adjusted in Variety of Notes, by a constant Motion of the Hand or Foot, down or up, successively and equally divided; so that every Down and Up is called a *Time* or *Measure*, whereby the Length of a *Semi-breve* is measured, which is therefore termed, The *Measure-Note*, or *Time-Note*.

MEASURES. I thought it would be a very Acceptable Thing to the Reader, to see in one View, an Account of the Ancient and Present Measures of several Parts of the World: Which therefore I have here given him, as I occasionally collected them from the Best Authors.

A TABLE of the Foreign Measures, Carefully Compared with the English.

	Suppose an English Foot divided into 1000 Equal Parts, those here mentioned are in Proportion to it, as follows.	The English Foot divided into Inches and Decimal Parts of an Inch.
London ————— Foot	1.000	0.12.0
Paris ————— the Royal Foot	1.068	1.00.8
Amsterdam ————— Foot	.942	0.11.3
Brill ————— Foot	1.103	1.01.2
Antwerp ————— Foot	.946	0.11.3
Dort ————— Foot	1.184	0.02.2
Rynland or Leyden ————— Foot	1.033	1.00.4
Lorain ————— Foot	.958	0.11.4
Mecblin ————— Foot	.919	0.11.0
Middleburg ————— Foot	.991	0.11.9
Stratsbourg ————— Foot	.920	0.11.0
Bremen ————— Foot	.964	0.11.6
Cologn ————— Foot	.954	0.11.4
Frankford ad Manam ————— Foot	.948	0.11.4
Spanish ————— Foot	1.001	1.00.0
Toledo ————— Foot	.899	0.10.7
Roman ————— Foot	.967	0.11.6
On the Monument of $\left\{ \begin{array}{l} \text{Cestucius} \\ \text{Statilius} \end{array} \right\}$ —————	.972	0.11.7
Bononia ————— Foot	1.204	1.02.4
Mantua ————— Foot	1.569	1.06.8
Venice ————— Foot	1.162	1.01.9
Dantzick ————— Foot	.944	0.11.3
Copenhagen ————— Foot	.965	0.11.6
Prague ————— Foot	1.026	1.00.3
Riga ————— Foot	1.831	1.09.9
Turin ————— Foot	1.062	1.00.7
The Greek ————— Foot	1.007	1.00.1
Paris Foot, according to Dr. Bernard —————	1.066	
Universal ————— Foot	1.089	
Old Roman ————— Foot	.970	
Bononian Foot of M. Auxout —————	1.140	
Lyon ————— Ell	3.976	3.11.7
Bologn ————— Ell	2.056	2.00.8
Amsterdam ————— Ell	2.269	2.03.2
Antwerp ————— Ell	2.273	2.00.2
Rynland or Leyden ————— Ell	2.260	2.03.1
Frankford ————— Ell	1.826	1.09.9
Hambourg ————— Ell	1.905	1.10.8
Leiping ————— Ell	2.260	2.03.1

The TABLE Continued.

Lubeck	Ell	1.908	1.09.8
Noremburg	Ell	2.227	2.03.3
Bavaria	Ell	.954	0.11.4
Vienna	Ell	1.053	1.00.6
Bononia	Ell	2.147	2.01.7
Dantzick	Ell	1.903	1.10.8
Florence	Brace or Ell	1.913	1.11.0
Spanish or Castile	Palm	0.751	0.09.0
Spanish Vare or Rod, which is Four Palms		3.001	1.00.0
Lisbon	Vare	2.759	2.09.0
Gibraltar	Vare	2.760	2.09.1
Toledo	Vare	2.685	2.08.2
Naples	Palm	0.861	0.09.6
	Brace	2.100	2.01.2
	Canna	6.880	6.10.5
Genoa	Palm	0.830	0.09.6
Milan	Calamus	6.544	6.06.5
Parma	Cubit	1.866	1.10.4
China	Cubit	1.016	1.00.2
Cairo	Cubit	1.824	1.09.9
Old	Babylonian	Cubit	1. 6. $\frac{24}{100}$
	Greek		1. 6. $\frac{11}{100}$
	Roman		1. 5. $\frac{426}{1000}$
Turkish	Pike	2.200	2.02.4
Persian	Arash	3.197	3.02.3

The Hebrew or Jewish Long-Measures.

	Feet	Inches	Parts
Cubit	1	09	888
Span, or Half-Cubit	0	10	944
Palm	0	03	648
Digit	0	00	912
Fathom, 4 Cubits, or	7	03	552
Ezekiel's Reed, 6 Cubits, or	10	11	328
Pole or Canna, 8 Cubits, or	14	7	104
Schœnus, Chain or Line	145	$\frac{2}{100}$	
Sabbath-Day's Journey, 2000 Cubits, or 3648 Feet.			
Eastern-Mile, 4000 Cubits, or 7296 Feet.			
Parasang, 12000 Cubits, or 24888 Feet, or $4\frac{1}{2}\frac{1}{1000}$ Miles.			
Stadium, $\frac{1}{3}$ of a Parasang, or 400 Cubits.			
A Day's Journey, 8 Parasangs, or 96000 Cubits, or 33,16 Miles:			

The Hebrew Measure of Capacity.

	Solid Inches	W. Gal.	Pints	Solid Inches
<i>Epha</i> , or <i>Bath</i> —————	1747.7	7	4	15.2
<i>Corus</i> , or <i>Chomer</i> , is —————	17477	75	5	7.0
<i>Seab</i> , $\frac{1}{3}$ of an <i>Epha</i> —————	582.5	2	4	3
<i>Hinn</i> , $\frac{1}{6}$ of an <i>Epha</i> —————	291.25	1	2	1.5
<i>Homer</i> , $\frac{1}{10}$ of an <i>Epha</i> —————	174.77	0	6	0.5
<i>Cab</i> , $\frac{1}{18}$ of an <i>Epha</i> —————	97.03	0	3	10
<i>Log</i> , $\frac{1}{72}$ of an <i>Epha</i> —————	24.25	0	0	24.2
To which add the <i>Syrian Metretes</i> , or <i>Congius Romanus</i> ————— }	207.06		7	$\frac{1}{8}$

The Grecian Long Measures.

Schoenes. This some will have to contain 60, some 30, others 32, and others 40 Furlongs.

Parasang, is the same with the Hebrew *Parasang*.

Dolich. This some will have to contain 24 Furlongs; but the common Account is 12.

Hippicon, containing 4 Furlongs.

Dialulus, Two Furlongs.

Plethron. This some make an Acre, as *Plutarch*; others $\frac{1}{2}$ of a Furlong, or 100 Feet, as *Suidas*; others 10000 Feet, as *Hesychius*; and some make it 100 Furlongs. But *Suidas* seems rightest in stating it 100 Foot.

Pygon. This *Hesychius* supposes the Length from the Elbow to the Fingers Bent, which some call *Palmipes*; that is, a Foot and a Palm, or 20 Fingers Breadth.

Pygme, is the Length from the Elbow to the End of the Hand, when the Fist is closed, and is two Inches shorter than the *Pygon*.

Orthodoron. Some make this a Palm, others a Span; but 'tis shorter by a Finger's Breadth than the Span, or Greater Palm.

Lichas, is usually reckon'd the Length or Span between the End of the Thumb and of the Forefinger, when both are separated and extended; and therefore is less than the *Orthodoron* by a Finger's Breadth. Some will have it the same with *Dichas*, which *Comper*, in his Dictionary, says, is but 3 Fingers Breadth; but the former Account seems rightest.

Palest, the same with *Doron*, is the Lesser Palm; being 4 Fingers Breadth, or 3 Inches English.

But there is great Uncertainty in these Accounts!

The Measures of Capacity, were,

1. The *Kypsele*. This *Scapula* reckons a Corn-measure, and is supposed to contain 6 Attick *Medimnoi*.

2. *Medimnos*, both Attick and Georgick, contained 48 Chænicæ, or 72 Sextaries. But because the Georgick Chænix was larger than the Attick, there must be some Difference between them.

3. *Metretes*. Some render this by *Cadus*, and some by *Amphora*; the latter is wrong, for the *Amphora* is another Measure. This *Legat*, and some others, will have equal to the Attick *Medimnos*. This was not the Syrian *Metretes*, mentioned *Jobn* 2. 6. for that was the same with the *Congius Romanus*.

4. *Amphora*, or *Amphoreus*. This was a Georgick Measure, and was half the *Medimnos* or *Metretes* *Georgicus*, as say some; others (as *Schrevelius*) will have it an Attick Measure, and to contain 3 Urns.

5. *Modion* was not what we call a Bushel, but a Measure much less. *Alsted* computes it to contain 8 Attick Chænicæ, or 12 Sextaries; Others make it hold 16 Sextaries; and others a Pint less than our Peck.

6. *Chous*, *Chus* and *Choas*, was of two sorts: the Attick held 6 Attick Sextaries, and the Georgick Chous 9 Georgick Sextaries.

7. *Chenix*. This some take for the Measure of Servants Food for one Day. The Attick Chænix, 'tis probable, held about one Attick Sextary and an half; and the Georgick 2 and $\frac{1}{2}$ of such. Others say, that the latter held but barely 2 Attick Sextaries. Some also mention a *Bilibral*, *Quadrilibral*, and *Quinquelibral* *Chenix*. So that 'tis hard to determine any thing certain, as to these Matters!

8. *Sextarius*, or *Xesta*. This some make 2 Kotyles, or $\frac{1}{2}$ of the Attick Chous. This Measure, say some Authors, would hold 20 Ounces of Water, others 24: Others are so exact as to tell you, that it held exactly 13 Ounces 7 Pennyweights and 18 Grains, *Troy*: Some say it held a Pint and an half of our Measure; and others will have it but half a Pint.

9. *Kotyle Attick*, is the Half Sextary. Some make this equal to the Roman *Hemina*; and then the Roman and the Attick Sextaries will be the same. This the Romans wrote *Cotyle*.

10. *Tetacton*. This was a Liquid Measure, being a fourth Part of the Attick Sextary, and therefore called also *Quartarius*. But the Georgick Sextary contained $2\frac{2}{3}$ of the Georgick Tetacton.
11. *Oxybaph*. This in the Attick Measure was the Twelfth Part of the *Chenix*; but in the Georgick the Eighth.
12. *Kyath*, in Latin *Cyathus*: One and half of this was an *Oxybaph*.
13. *Coucha* was the Half of a *Kyath*.
14. *Mystrum*, the Half of the *Coucha*.
15. *Cheme*. One *Mystrum* contained $2\frac{1}{3}$ of the *Cheme*.

A TABLE of Grecian Exotick Measures, compared with the Attick.

1. *Achana Persica*. This, according to *Hefschius*, was a Corn-measure, and contained 7 Kypseles, and 3 Medimni.
2. The Syrian *Metretes*: Which our very learned Dr. *Cumberland*, Bishop of *Peterburgh*, hath proved to be the same with the *Congius Romanus*, and holds of our Measure 7 Pints, and $\frac{2}{3}$ or 207.06 solid Inches. This is what we translate (but wrongly) a *Firkin*, *John 2. 6.*
3. *Artaba Persica*. This, from the Authority of *Herodotus*, *Lib. 1. Pag. 49.* may be concluded to hold 3 Chænices more than the Attick Medimnus. *St. Jerom*, on *Isaiah*, *Chap. 5.* saith, that this Measure held 20 *Modii*.
4. *Kyprus*, or *Cyprus*, was the same with the Attick Medimnus.
5. *Artaba Egyptica*. This *Epiphanius* makes the same with the Attick Medimnus; as also was, saith he, the Median *Artaba*: But *Famius* and *Legat* make it but $3\frac{1}{3}$ *Modii*.
- Medimnus Kyprius*, $\left\{ \begin{array}{l} \text{Saluminea,} \\ \text{Papho,} \end{array} \right\}$ contained $\left\{ \begin{array}{l} 5 \text{ Modii.} \\ 4 \text{ Modii, and 1 Chous;} \end{array} \right.$
7. *Collathum Syrium*, was the same Measure with the Pontick Modius, and was double to the Common Modius. And the like Quantity did the
8. *Ponticus Cyprus* contain also, as *Epiphanius* saith.
9. *Subitha Syria*, held 22 Attick Sextaries.
10. *Mares Ponticus*, held (according to *Epiphanius*) 20 Alexandrian Sextaries; which how much different from the Attick I know not.
11. *Kopinus*. This was a Boetick, both Liquid and Dry; and *Legat* saith it held 3 *Congii*.
12. *Modius Cyprius*, is a Measure containing 17 Attick Sextaries.
13. $\left\{ \begin{array}{l} \text{Kamsaces,} \\ \text{Tetarpe Laconices,} \end{array} \right\}$ each a Measure of twelve Sextaries.
14. *Dadix*, a Boetick Measure, containing six Chænices.
15. *Aphin*, an Egyptian Measure of 4 Chænices: And of the same Measure doth *Hefschius* make the *Topium* to be; but he tells us not where the *Topium* was used.
16. *Caphira*, a Persian Measure of two Attick Chænices. To this was the *Mares* equal; and some say was a Measure used in *Boetia*.
17. *Inion*. This with the Egyptians, saith *Legat*, was the Word for the Sextary; and, according to *Epiphanius*, held just two Pound of Oyl.
18. *Elenius*, the same with the *Tetarton*, or one Quarter of a Sextary.
19. *Gabenon*, the same with the *Oxybath* or *Aretabule*.
20. *Alabastron* was a Measure containing a Pound of Oyl.

A TABLE of English Long Measures.

inch	Palm		Span		Foot		Cubit		Yard		Ell		Pace		Fath.		Pole		Furl.		Mile.	
3	3		3		3		3		3		3		3		3		3		3		3	
9	9		9		9		9		9		9		9		9		9		9		9	
12	4		1 $\frac{1}{3}$		1 $\frac{1}{3}$		1 $\frac{1}{3}$		1 $\frac{1}{3}$		1 $\frac{1}{3}$		1 $\frac{1}{3}$		1 $\frac{1}{3}$		1 $\frac{1}{3}$		1 $\frac{1}{3}$		1 $\frac{1}{3}$	
18	6		2		1 $\frac{1}{2}$		1 $\frac{1}{2}$		1 $\frac{1}{2}$		1 $\frac{1}{2}$		1 $\frac{1}{2}$		1 $\frac{1}{2}$		1 $\frac{1}{2}$		1 $\frac{1}{2}$		1 $\frac{1}{2}$	
36	12		4		3		2		1 $\frac{1}{4}$		1 $\frac{1}{4}$		1 $\frac{1}{4}$		1 $\frac{1}{4}$		1 $\frac{1}{4}$		1 $\frac{1}{4}$		1 $\frac{1}{4}$	
45	15		5		3 $\frac{3}{4}$		2 $\frac{1}{2}$		1 $\frac{1}{4}$		1 $\frac{1}{4}$		1 $\frac{1}{4}$		1 $\frac{1}{4}$		1 $\frac{1}{4}$		1 $\frac{1}{4}$		1 $\frac{1}{4}$	
60	20		6 $\frac{2}{3}$		5		3 $\frac{1}{3}$		1 $\frac{2}{3}$		1 $\frac{2}{3}$		1 $\frac{2}{3}$		1 $\frac{2}{3}$		1 $\frac{2}{3}$		1 $\frac{2}{3}$		1 $\frac{2}{3}$	
72	24		8		6		4		2		1 $\frac{1}{2}$		1 $\frac{1}{2}$		1 $\frac{1}{2}$		1 $\frac{1}{2}$		1 $\frac{1}{2}$		1 $\frac{1}{2}$	
198	66		22		16 $\frac{1}{2}$		11		8 $\frac{1}{2}$		6 $\frac{1}{2}$		4 $\frac{1}{2}$		3 $\frac{1}{2}$		2 $\frac{1}{2}$		1 $\frac{1}{2}$		1 $\frac{1}{2}$	
7920	2640		880		660		440		220		176		132		110		40		10		1	
633 0	21120		7040		5280		3520		1760		1408		1105 6		880		320		8		1	

A TABLE of *Square Measures.*

[illegible]

Dry Measures of Capacity, are rais'd from the Gallon containing 8 Pints, which should be contained in $272\frac{1}{4}$ Cubick Inches, and should hold of pure Running or Rain-Water, 9 Pound, 13 Ounces, 12 Drams and $\frac{1}{2}$, *Averdupois* Weight: so that to have a true Gallon for *Dry Measure*, you must make a Cubick Vessel that shall have all the Sides 6 Inches, and $\frac{4}{5}\frac{8}{10}$ Parts of an Inch square. Or if you would weigh with *Averdupois* Weight, 9 Pound, 13 Ounces, and 12 $\frac{1}{2}$ Drams of clean Running Water.

A TABLE of *Dry Measures.*

Pints		8		Gallons															
16		2		Pecks															
64		8		4		Bushels													
128		16		8		2		Strikes											
256		32		16		4		2		Carnock or Coom									
512		64		32		8		4		2		Seem or Quarter							
3072		384		102		48		24		12		6		Way					
5120		640		320		80		40		20		10		12		Last			
1 lb		8 lb		16		64		128		256		512		3072		5120		Troy	
14 3		7 lb		14		56		1 C.		2 C.		4 C.		24 C.		40 C.		Averd.	

Liquid Measure, is either of *Wine, Ale, or Beer.*

The *Wine Gallon* contains 231 Cubical Inches, and should hold of pure Running Water 8 Pound, 1 Ounce, 11 Drams *Averdupois*; or 9 Pound, 10 Ounces, 1 $\frac{1}{4}$ Penny-weight, *Troy*; or a Cubick Vessel of 6 Inches, and 1300 Parts every way.

A TABLE for *Wine-Measure, Honey, Oyl, &c.*

						Galls.	Pints
						18	8
						Rundl.	
						18	144
						Barrels	
						$1\frac{3}{4}$	$31\frac{1}{2}$
						$1\frac{1}{3}$	42
						Terces.	
						$1\frac{1}{3}$	$2\frac{1}{3}$
						Hogsh.	
						$1\frac{1}{2}$	2
						$2\frac{1}{2}$	62
						Puncb.	
						$1\frac{1}{3}$	$2\frac{2}{3}$
						$4\frac{1}{2}$	84
						$1\frac{1}{2}$	726
						Butt or Pipe	
						$1\frac{1}{2}$	2
						3	4
						6	8
						14	252
						2016	

The Beer or Ale Gallon holds 282 solid Inches, and weighs of pure Water 13 Pound, 3 Ounces $1\frac{4}{16}$ parts, *Averdupois*; therefore the Cubick Vessel ought to be 6 Inches, and 5500 parts of an Inch each way, to find this Gallon.

A solid Foot contains 1728 solid Inches; that is, 6.128 Gallons; and a *Hogshead* contains 10.287 solid Feet; or if in round Numbers you allow 10 Feet to be in a *Hogshead*; then the *Butt* will contain 20, and the *Tun* 40 Feet.

A TABLE for Beer Measure.

			Gallons.	Pints.
		<i>Firkins.</i>	9	72
<i>Kilderkins.</i>	2		18	144
<i>Barrels.</i>	2	4	36	288
<i>Hogsheads.</i>	2	4	72	576

A TABLE for Ale Measure.

			Gallons.	Pints.
		<i>Firkins.</i>	9	64
<i>Kilderkins.</i>	2		18	128
<i>Barrels.</i>	2	4	36	256
<i>Hogsheads.</i>	2	4	72	512

A Degree, or $\frac{1}{360}$ part of the Circuit of the Earth, according to

Dr. Bernard, is $\begin{cases} 73\frac{1}{4} \text{ English Miles, of 5000 Foot in a Mile.} \\ 67\frac{1}{4} \text{ Catholick Miles.} \\ 66\frac{1}{2} \text{ Arabick Miles.} \end{cases}$

Mr. Norwood, $69\frac{1}{2}$ English Miles, or 367200 Feet.

Mr. Ricard, ————— 36584 Feet.

MEATUS Auditorius, the Auditory Passage, begins from the *Concha* and winds towards the inward part of the Ear, and is clothed with a thin Skin as far as the brim of the *Tympanum*, or Drum of the Ear: Its use is to receive the Sound, and to convey it easily, but yet ruly and so effectually to the *Tympanum*; within this Cavity is the *Ear-wax*, or *Cerumen*.

MEATUS Urinarius. See *Urethra*.

MECHANICKS, Dr. Wallis defines to be the Geometry of Motion; and is a Mathematical Science which shews the Effects of Powers, or moving Forces, so far as they are applied to Engines; and demonstrates the Laws of Motion, &c.

'Tis also commonly taken for those Handy-crafts, which require as well the Labour of the Hands, as the Study of the Brain.

The Principle on which all Mechanick Power depends, will be easily understood by the Resolution of this Problem.

Any Body as A, with its Celerity C, being given; and also another Body as B: 'Tis required to find the Velocity necessary, to make the Moment, or quantity of Motion in B, to be equal to the Moment of A, the given Body.

Now since the Moment of any Body is equal to the Rectangle under the Celerity and the Quantity of Matter; as you will find in the *Laws of Motion*, (see the Word *Motion*;) You need only make as B to A::fo is C to a fourth Term, which will be c, the Celerity proper to B, so that its Moment shall be equal to that of A.

And from hence it follows, That any Body, though never so small, may have a Moment equal to that of any other Body, tho' never so great, which shall be moved with any given Celerity.

Wherefore in any Machine or Engine, if the Velocity of the Power, be made to the Velocity of the Weight:: reciprocally as the Weight is to the Power; then shall the Power always sustain or move the weight.



If Qp be drawn Perpendicular to the Thread Np , so as to cut the Plane pG , in a Line Parallel to the Horizon: And if the Weight p be supposed to lie only on the two Planes pQ , and pG , the Weight will press these Planes Perpendicularly with the Forces pH , and HN : That is, it will press the Plane pQ , with Np ; and the Plane pG , with HN .

Wherefore, if Qp be supposed to be taken away, so that the Weight p may stretch the Thread Np ; then, because the Thread now sustaining the Weight, supplies the Place of the Plane pQ , the Thread will be stretch'd by the Force Np , which before pressed on the Plane pQ .

Wherefore the Tension of this Oblique String, to the Tension of the other Perpendicular one Np : is as pN is to pH .

And consequently, if the Weight p , be to the Weight A : in a Ratio, compounded of the reciprocal Ratio of the least Distances of the Threads AM , and pN , from the Centre of the Wheel, and of the direct Ratio of pH , to pN , the Weight will be in *Equilibrio*, as any one may soon try.

Hence 'tis plain, that the Weight p lying on those two Oblique Planes, is in the Nature of a Wedge within the Parts of a Cloven Body; and consequently the Forces of the Wedge and Beetle may from hence also be known.

For the Force with which the Weight p presses the Plane pQ , is to the force with which either by its own Gravity, or by the stroke of the Beetle it is impelled according to the Line Hp in that Plane, :: as pN , is to pH , and to the Force with which it presses the other Plane pG : as pN . NH .

And since the Screw is nothing but a Wedge forced by a Leaver, its Power or Force may by this Method be easily calculated.

Wherefore (adds the Excellent Author :) This Corollary is of most Extensive Use, since all Mechanicks depend upon it.

MECHANICK Powers, (as they call them) are Six, viz. The Balance, the Leaver, the Wheel, the Pulley, the Wedge, and the Screw; to some or other of which, the force of all Mechanical Inventions, must necessarily be reduced. See those words.

MECHANICAL Philosophy, is the same with the *Corpuscular*, which endeavours to explicate the Phenomena of Nature from Mechanical Principles; i. e. from the Motion, Rest, Figure, Position, Magnitude, &c. of the Minute Particles of Matter. And these Principles are frequently called

MECHANICAL Causes: And also the

MECHANICAL Affections of Matter.

MECHANICAL Solution of a Problem in Mathematics, is either when the Thing is done by repeated Tryals, or when the Lines made use of to solve it are not truly Geometrical. Thus the Method of *Nicomedes*; *Erastosthenes*, *Pappus* and *Vieta*, for finding two mean Proportionals; and that of *Nicomemus* and *Dionysius*, for dividing an Angle into any Parts assigned, by means of the *Quadratrix*, is *Mechanical*: Because the former is done by repeated Tryals, and the latter by the means of a Curve that is not truly Geometrical.

MECONIUM, properly is an Opiate, or the condensed Juice of Poppies. Also the Excrements of a *Fetus*, which stick to the Intestines after

the Birth, are improperly so called; from the Blackness of their Colour, like to that of Poppy Juice.

The *Opium* which we have in England, France, &c. is only a *Meconium* made by expressing the Juice of the Oriental Poppies, which is thickened a little by Evaporation, and then wraps up in Leaves to be sold here: But the *Turks*, &c. keep the Tears of their Poppies, or the true *Opium* to themselves, and will not vend them abroad.

MEDALLIONS, are large Medals Coined, not as Current Money, but on some special extraordinary Occasion.

MEDALS, are Pieces of Metal like Money, Stamp'd or Coined upon some Extraordinary Occasion, to perpetuate the Memory of some great and Eminent Person, or of some considerable Victory, or other Publick Benefit to a Nation, or People.

They divide *Medals* into *Ancient* and *Modern*; and they account *Ancient*, all such as were Coined between the Third and Ninth Age of Christ. The *Modern* are such as have been made within these last 3 or 400 Years.

Of the *Ancient Medals*, the most *Ancient* are the *Greek*; and the *Consular Medals*, are the most *Ancient* of the *Latin* ones.

MEDIANA Vena, is the Middle Vein in the bending of the Cubit, betwixt the Cephalick and Basilick; it is safely opened, because there's neither Nerve nor Artery under it.

MEDIAL Alligation. See *Alligation Medial*.

MEDIASTINUM, is a doubling of the *Pleura*, or Membrane clothing the internal Parts of the *Thorax*, Ribs, &c. and it divides the Lungs and other *Viscera* of the Breast, into two parts. It proceeds from the *Vertebres* of the Back, and going on forward, reaches the Breast-bone, and there makes an eminent Partition in the very middle of the *Thorax*.

MEDIASTINA, is a Branch of the *Subclaval Veins*, which ordinarily comes from the Trunk of the *Cava*; it goes to the *Mediastinum* and *Thymus*.

MEDIATION, according to some Writers of Arithmetick, is Division by 2, or taking the half of any Number or Quantity. This is called also *Bipartition*; and in Reference to Lines, usually *Bisection*.

MEDIATUS Lingue, or *Party-Jury*, is a Jury Impanelled upon any Cause, wherein a Stranger is Party, whereof the one half consists of Denizens, the other of Strangers, and is used in Pleas, where one Party is a Denizen, and the other a Stranger.

MEDICINE, or as 'tis commonly called *Physick*, is an Art assistant to Nature, and designed for the preserving of Health in Humane Bodies, as much as is possible, by the Use of convenient Remedies. *Sennertus* and others, divide it into five parts.

1. *Physiologia*, which treats of an Human Constitution, as it is found and well; to which belongs *Anatomy* too.

2. *Pathologia*, which treats of the Preternatural Constitution of our Bodies.

3. *Semiotica*, which treats of the Signs of Health and Diseases.

4. *Hygiena*, which delivers Rules for the Regimen to be observed in the Preservation of Health.

5. *Therapeutica*, which teaches the Management of

of *Diet*; and comprehends *Chirurgery*, and the Art of *Medicine*, properly so called.

The general Division of *Physick* is only into two Parts; the *Theory* and the *Practick*: An accurate Skill in both which, are necessary to make a Man a good Physician.

MEDIO *Acquittando*, is a Writ Judicial, to distrain a Lord for the acquitting a Mean Lord from a Rent, which he formerly acknowledged in Court, not to belong to him.

MEDIUM in Natural Philosophy, signifies that peculiar Constitution of any Space or Region through which Bodies move. Thus the *Aether* is supposed by some to be the Medium in which the Planets and Heavenly Bodies move. The *Air* is the Medium in which all *Meteors* are generated and move; and by the means of which it is that all Land Animals, as Insects, Birds, Beasts, and Men, can Breathe and Live. But water is the Medium in which Fishes Live and Move. And whatever Density, or Tenacity there is in the Parts of this *Fluid Medium*, whereby Bodies moving in it are hindered or stopped, so that the Motion becomes slower, or is made in part to cease, is called the *Resistance of the Medium*. And Sir Isaac Newton hath proved, That this Resistance of the Medium to the Motion of Bodies, is always as the Square of the Velocity of the moving Body. *Princip. Philos. Math. p. 245.* See *Resistance of the Medium*.

MEDIUS Venter, See *Thorax*.

MEDULLA Cerebri is the white soft part of the Brain, covered on the outside with the Cortical Substance, which is of a more dark or ashy-colour: It is called also the *Corpus callosum*, and is an Union or Conjunction of both sides of the Brain into one. *Willis* observed, That this Part consisted of an Innumerable Number of *Seriae*, or *Fibrae*, tending length-wise: And *Malpighius* asserts, That by the help of a Microscope they appear so visible as to look something like the Teeth of an Ivory Comb.

MEDULLA oblongata, is that part of the Brain within the Skull, which is the beginning of the Spinal Marrow; it is about 3 or 4 Inches in length within the Skull, and then it descends to the *Os Sacrum*, thro' the Hole of the hinder part of the Head and the Vertebrae: It sends out ten pair of Nerves to the Chest, the Abdomen, and the Limbs. It is call'd also the *Common Sensory*, because the Original of the Nerves being there, it is the common Place or Recepracle of all that comes to the Brain by the external Senses.

MEDULLA Ossium, Marrow in the Bones, is a soft fat substance plac'd in the Cavities, or Porosities of the Bones; it is kept in a Membrane, and is quite destitute of all Sense; it is red in the greater Cavities, white in the less, and soft and succulent in spongy Bones.

MEDULLA Spinalis, or the Spinal Marrow, is the Continuation of the *Medulla Oblongata* without the Skull; and which passing thro' all the Vertebrae of the Back, ends at last at the *Os Sacrum*; it is a kind of Coagmentation of Nerves, sending out thirty pair of Nerves on each side, to the Limbs, to the great Cavities, and other parts of the Body. If it be wash'd with a convenient Liquor, it will sever into a great many little Fibres, which also are very conspicuous in its Original, the *Medulla Oblongata*.

MEDULLA of a Plant, or rather Tree, is the same with *Corv*; which see.

MEDULLARY Oil, is the finer and more subtil part of the Marrow of the Bones; which passes into them not by Ducts (saith Dr. *Havers*) but by small Pores formed into the Vesicles or Glandules (which are conglomerated into distinct Lobules contained in several Membranes, or Bags, and these Bags are contained in one common Membrane investing the whole Marrow: And all these Vesicles, Bags, and Coat or Membrane are propagated from the outward Coat of the Arteries) by which it passes from one to another, till it arrives at the sides or extreem parts of the Bone.

That part of it which is supplied to the Interstices of the Joints, passes into them by Passages, penetrating thro' the Bone into those Cavities, and formed for this end.

The Use of this Oil is either common to all the Bones, whose Temper it preserves and keeps them from being too brittle: Or more peculiar for the Joints; where it is very serviceable,

1. To lubricate the Extremities of the Bones, that they may move the more easily and freely.

2. To keep the ends of the Articulated Bones from too great an Incalcescence or Heat.

3. It preserves the Joints also from wearing by Attrition, or grating one against another. And

4. It preserves the Ligaments of the Joints from Driness and Rigidity; and lubricates those parts of them also that slide upon the Bones, and it keeps the Cartilages which are join'd to any of the Bones in a flexible Condition.

MELA is a Chirurgeons Instrument, called also *Speculum*, the Vulgar call it *Tenta*, a *Tent*, from trying. It is made for the most part of Silver, or Ivory, and its Use is to probe Ulcers, or to draw a Stone out of the Yard, &c. It is of different Shapes, according as it is differently designed to be used.

MELANAGOGUES are Medicines that expel black Choler, or Melancholy, as the Ancients us'd to express themselves.

MELANCHOLY, is a Doating, without a Fever or Raving; or a *Delirium* proceeding from a kind of Sadness of the Patient, whereby the Animal Spirits seem to be moved more slowly than they were wont. *Blanchard*.

MELICERIA, called also *Hydaribrus*, and *Ischor*, and sometimes *Hydrops Articularis*, is a Tumor shut up within a Tunick, proceeding from Matter like Honey, without Pain, round, yielding if pressed, but quickly returning again. It seems to proceed from the Lymphatick Particles which do not circulate right; and which, when the Moisture is evaporated, leave a honeyish kind of Substance. *Blanchard*.

MELICRATUM, is a Drink made one part of Honey, and eight parts of Rain Water.

MELIUS inquirendo, is a Writ that lieth for a second Inquiry of what Lands and Tenements a Man died seized, where Partiality was suspected upon the Writ of *Diem clausit extremum*.

MELOPES, *Vibices*, *Enchymoma*, *Sugillationes*, all signifie the same thing; and are red Spots (like those which remain in the Skin after bearing) in Malignant and Pestilential Fevers. *Blanchard*.

MELOS, a Disease of the Eye, when there is so great an Irruption of the *Uvea* Tunicle; that it seems like an Apple. *Blanchard*.

MEMBRANA, is a nervous, fibrous, broad, plain, white, and dilatible Substance, which covers

vers the Bowels, the great Cavities of the Body, the Muscles, &c. and is endowed with an exquisite Sense.

MEMBRANA Musculorum Communis, the Common Membrane, or Covering of the Muscles, is spread over all the Body, except the Skull, and is knit by Fibres something loosely to the *Membrana Carnosa*, lying above it; and to the proper Membrane of each Muscle which lies under it; it is very thin, but strong, of a whitish Colour, and almost transparent. It serves not only as a common Bag to the Muscles, and helps to keep them in their proper Places; but also to moisten them, and to besmear their Tendons with a Mucilaginous Liquor, which lubricates them, and forwards their Motion and Action.

MEMBRANA Adiposa. See *Adiposa Membrana*.

MEMBRANA Carnosa, the same that *Panniculus Carnosus*.

MEMBRANA Nistitans. See *Nistitans*.

MEMBRANA Urinaria, the same with *Allantois*.

MEMBRANOSUS, is a Muscle of the Leg, so called from the large Membranous Expansion it is Continuous with, inclosing all the Muscles of the *Tibia* and *Tarsus*; whence it is also called *Fascia lata*: It hath an acute fleshy Beginning from the Fore-part of the Spine of the *Os Ilium*, between the Origination of the *Sartorius* and Tendinous Beginning of the *Gluteus Magnus*; and being dilated to a fleshy Belly, which fills the Interstice made by the first of the two last-named Muscles and Upper part of the *Rectus* and Fore-part of the *Gluteus Medius*, in its Oblique Descent becomes Tendinous, four Fingers Breadth below the great *Trochanter*, whence it passes directly over the *Vastus Externus* to its proper Termination, at the superior *Appendix* of the *Fibula*; but in its Progress thither, it is conjoined with the Tendinous Expansion of the *Gluteus Magnus*, which ariseth from the Spine of the *Ilium*, covering the external Part of the *Gluteus Medius*, and all the external Muscles of the *Tibia*, as well as those of the Thigh-bone; and descending over the *Patella*, comprehends the Muscles of the *Tarsus*, and joins with the *Ligamentum Annulare*, which retains the Tendons of the Toes and Feet: When this Muscle acteth, the Leg and Thigh are drawn outwards.

MEMBRED: In Heraldry those Birds which are either whole-footed, or which have no Tallons, are termed by this Word *Membred*.

MEMORY, is that Faculty of the Soul, which repeats Things perceived by former Sensations; or is the calling to mind of known and past Things; as when we conceive Heat or Light, Yellow or Sweet, &c. the Object being removed; and is as it were the Store house of our *Ideas*.

MENDOSA Sutura, or *Squammea*, is a scaly Connexion of the Bones of the Skull; as may be seen in the Bone of the Temples, and the Bone of the Fore-part of the Head.

MENINGES, are the thin Skins that inwrap the Brain, and which are called *Matres* by the *Arabians*; as if all the Membranes of the Body were propagated by and from them. They lie immediately within the Skull, and are Two in Number; viz. the *Dura mater*, or *Crassa meninx*; and the *Pia mater*, or *Tenuis meninx*; which see.

MENINGOPHYLAX, is that which preserves the *Meninx* or Membrane of the Head, as thin Gold or Silver Plates, which are applied when the Skull is opened. *Blanchard*.

MENINX, see *Mater dura & tenuis*.

MENISCUS Glasses, are those which are Convex on one side, and Concave on the other.

For finding the *Focus* of a *Meniscus*, the Rule is this:

As the Difference of the Semi-diameters of the Convexity and Concavity, to the Semi-diameter of the Concavity; so is the Diameter of the Convexity to the Focal Length.

MENOPEGIA, is a sharp Pain in the Head, affecting one single Place.

MENSTRUUM, the Chymical Word for a Dissolving Liquor. They gave it this Name, because some Chymists pretend that the complete Dissolution of a Mixt cannot be done in less Time than 40 Days; which Period they call the *Philosophical Month*.

And from hence the Word *Menstruum* hath come to be the general Term for any Dissolvent; and any Liquor which will exactly dissolve all the Parts of any Body, is called a proper *Menstruum* for that Body: As *Aqua Regalis* is for Gold; *Aqua Fortis*, or Spirit of Nitre, for most other Metals; *Common Water* for Salt, or Sugar, &c.

And here it may not be amiss to give a Solution of one Difficulty, viz. Why great Lumps or Fragments of Gold, &c. will readily descend to the Bottom of the Glass, and yet when they come to be cut or divided into very small Particles or Atoms, tho' of the same specifick Gravity with those greater Lumps, yet these shall swim, and be suspended in the *Menstruum*.

In order to the accounting for which, we may first consider, That the Parts of no Fluid can be so easily separable, but that they will a little resist or retard the Descent of any heavy Body through them; and this Resistance is (*ceteris paribus*) still proportionable to the Surface of the descending Bodies. But the Surfaces of Bodies do by no means increase or decrease in the same Proportion as their Solidities do: For the Solidity increases as the Cube, but the Surface only as the Square of the Diameter. Wherefore 'tis plain very small Bodies will have much larger Surfaces, in Proportion to their Solid Content, than larger Bodies will; and consequently, when they grow exceeding small, may easily be conceived to be buoyed up by the Fluid.

Indeed it doth sometimes happen that a *Menstruum* will dissolve and keep suspended in it, without letting them emerge to the Top, the Parts of a Body lighter in *Specie* than it; as when Camphire is dissolved into a Liquor, and that Liquor well mingled with Oyl of Vitriol; which is an Effect not agreeable to the Laws of *Hydrostaticks*: But then it may be consider'd, that there may be some such peculiar Texture in the Parts of the Camphire, as may make them so joyn or adhere to the Parts of the Oyl, as that, tho' heavier, yet they shall not be impelled up to the Surface, at least for a Time: Which we see is the Case, in some measure, of an accurate and well-proportioned Mixture of Oyl and Water.

Mr. Boyle mentions a *Menstruum* which he extracted from Bread alone, that would work on Bodies more compact than many hard Minerals, nay, even on Glass it self, and do many things that *Aqua Fortis* could not do. It was thus made: Cut Brown Household-Bread, either of Wheat or

Rye,

Rye, (though the Rye is best) into Slices ; and when they are a little dried, fill with them a Glas Retort, and draw off in a Sand-Furnace by Degrees of Fire, what will come over. Separate the Oyl from the Liquor in the Receiver by a Tunnel, or a Filtre, and in a gentle Heat free the Spirit from some of its Phlegm, (though this is not always necessary). With this, he saith, he drew Tinctures not only from Crude Corals, but even from the *Lapis Hematites*, and *Granates*, unpowdered ; nay, also from Diamonds and Rubies. Yet by no means was this so Corrosive a Liquor as *Aqua Fortis*, or as the other Acid Menstruums.

From hence therefore we may learn to suspend our Assent as to that bold Assertion of some Physicians and Naturalists, That 'tis impossible any Medicine can be found out, that shall dissolve the Stone in the Bladder or Kidneys, but what must also corrode and destroy the Vessels through which it passes in the Body. For there are many Menstruums effectually Corrosive, that will not work at all on some Bodies ; which yet other Things, though of no such Corrosive Nature to the Tongue or the Touch, will readily dissolve. Thus Quicksilver will dissolve Gold, though there be no sensible Appearance of any Corrosiveness in the Mercury, either to the Finger, or even to the Tongue ; and yet neither *Aqua Fortis*, nor Oyl of Vitriol, nor Spirit of Nitre, will touch this Metal, though they are some of the most Corrosive Menstruums in Nature. Cold Water will dissolve the White of an Egg ; which the purest Spirit of Wine will not divide, but coagulate ; as will also the Acid Liquors, Spirit of Salt, and Oyl of Vitriol. Thus also Common Oyl will dissolve Brimstone, though it appear so soft and smooth upon the Tongue, and will not dissolve so much as an Egg-shell ; and yet that General Dissolvent, *Aqua Fortis*, will not touch Brimstone. Many more Instances of this Nature might be given ; by which it appears, that Menstruums do not operate by virtue of any manifest Quality, such as Heat, Moisture, or even Acidity it self, but rather by some mechanical and peculiar Fitness that there is between the Shape, Bulk, Solidity, &c. of the Corpuscles both of it and the Body to be dissolved.

MENSTRUUM Peracutum, is a Menstruum mentioned by Mr. Boyle, and made by drawing off Spirit of Nitre several times from Butter of Antimony. He saith, That by the Help of this, he was able, without a very violent Fire, and in a few Hours, to elevate a good Quantity of Crude Gold ;

MENSURABILITY, is an Aptitude in a Body, whereby it may be apply'd or conform'd to a certain Measure.

MENSURATION, or *Measuring*, is to find the Superficial Area, or Solid Content, of all Surfaces and Bodies. The Rules to do which, as exactly as is possible, you will find under the Names of the several Figures and Solids.

MEPHITICAL Exhalations, are poisonous or noxious ones, issuing out of the Earth. These the *Latins* used to call *Mephites* ; whence comes the *Italian Mofeta*, which is the Term they have for the famous *Grotta de Cani*, near *Pizzoli*, about two Miles from *Naples*, which is so called, because its poisonous Streams will kill Dogs, (and no doubt any other Animals) if held long over, and within the Stench of the Streams.

MERCATOR'S Chart, or *Projection*, is a Projection of the Face of the Earth in *Plano* ; wherein the Degrees upon the Meridian increase towards the Poles in the same Proportion that the parallel Circles decrease towards them.

'Tis called *Mercator's Chart*, or *Projection*, because *Mercator* was the first that published Charts so made : Tho' our Country-man Mr. *Wright* was really the first that made the Tables for this *Projection*.

Though the *Plain Chart* be very easie and useful in short Voyages, and will serve in the longest Voyages, if you sail Home in or near the opposite Rhumb you went by ; as the Ancients, who being Coasters, did before the Use of the Compass : Yet so far as few Places, or indeed none but such as lie under the same Meridian, or under the Equinoctial, can therein be expressed according to their true Situation and Distance one from another ; but if they be laid down true by the Course and Distance, the Difference of Longitude will be false ; if they be laid down by the Course and Difference of Longitude, then will the Distance and Difference be more than it should be ; and if they be laid down by their Distance and Difference of Longitude, (which in many Cases is impossible) then the Difference of Latitude will always be too little, and the Rhumb too wide from the Meridian ; and if they be laid down by their Latitudes and Separation, then the Course will be wide, and the Distance too much, &c.

And since that the Places in particular *Maps* or *Charts* being laid down in some, one way, and in others another, and these Pieces many times tack'd together, without due Consideration of the differing Methods, Places have been laid down by : This, I say, being so, the *Geography* and *Hydrography* of the World is so corrupted, that too many Descriptions of the Whole, or of the large Parts of it, are enormously Erroneous, and the Shape of the Land much distorted. It were to be wished therefore, that the World would not put over-much Value on, but wean it self from the Use of the *Plain Chart* ; and by making the *True Chart* easie and Familiar, bring it in Respect and Use.

It was the great Study of our Predecessors, to contrive such a *Chart in Plano*, with strait Lines, on which all or any Parts of the World might be truly set down, according to their Longitudes, Latitudes, Bearings or Distances.

A Way was hinted for this near Two thousand Years since by *Ptolemy*, and a General Map according thereto, made in the preceding Age by one *Mercator* ; but the Thing demonstrated, and a Ready Way shew'd of describing it, was not 'till Mr. *Wright* taught to enlarge the *Meridian Line* by the continual Addition of Secants ; so that all the Degrees of Longitude might be proportional to those of Latitude, as on the Globe : Which he has done after such an Excellent Manner, that in many Respects, it is far more convenient for the Navigator's Use, than the Globe it self ; and will truly shew the Course and Distance from Place to Place, which way soever a Ship sail forth, or return.

PROBLEMS.

1. To find the Meridional Miles, answering to any Difference of Latitude.

First, By the Table of Meridional Parts, which are printed in most Books of Navigation,

Find the Degrees of either Latitude over-head, and the Minutes in the Left-hand Column downwards; and in the Angle of meeting are the Parts for that Latitude.

Thus also find out the Parts for the other; then, if both Latitudes be of the same Name, that is, both North, or both South, subtract these one from the other; and that Remainder contains the Meridional Miles sought. If of different Name, add them together; as in Example 2.

Example.

Required to find the Meridional Miles between Latitude $43^{\circ} 15'$ North, and $50^{\circ} 20'$ N.

Latitude $50^{\circ} 20'$ ———— 35057 } Mer. Pt.
Latitude $43^{\circ} 15'$ ———— 28837

Merid. Difference of Lat. — 6220

Example 2.

Let one Lat. be $20^{\circ} 19' S.$ — 12423 } Mer. Pt.
The other Lat. $18^{\circ} 53' N.$ — 11541

Merid. Difference of Lat. — 23963 Sum.

PROBLEM II.

2. To find the Meridional Difference of Latitude by the Table of Artificial Tangents.

The Logarithmick Tangents above 45 Degrees, accounting every 30 Minutes to be one Degree, and every Minute to be two Minutes of the Meridian Line, are in the same Ratio with the Meridional Parts, made by the continual Addition of Natural Secants.

Therefore, Take half of each of the Given Latitudes, and to each half add 45° , looking the Tangents of their Arches in the Table of Logarithmick Tangents; the Difference of these Tangents divide by 1263, the Quotient will be the Meridional Miles or Minutes.

Example 1.

Lat. $50^{\circ} 20'$, its $\frac{1}{2}$ — $25^{\circ} 10'$; which added to 45° , makes $70^{\circ} 10'$, whose Tangent is ———— 4428786

$\frac{1}{2}$ Lat. $43^{\circ} 14'$, is $21^{\circ} 37'$; which added to 45° , makes $66^{\circ} 37'$, whose Tangent is, omitting the Index, ———— 3642940

1263) 785846 (622 = Merid. Diff.
280
278
260

Example 2.

The $\frac{1}{2}$ of Lat. $20^{\circ} 19' S.$ is $10^{\circ} 18'$, which added to 45° , make $55^{\circ} 8'$, whose Tangent is ———— 1570607

$\frac{1}{2}$ Lat. $18^{\circ} 53' N.$ is $9^{\circ} 26'$, which added to 45° , makes $54^{\circ} 26'$, its Tangent is ———— 1457970

1263) 3028577 (2397 = Mer. Diff. Lat.

50260

123

100

1166

PROBLEM III.

3. The Latitudes and Difference of Longitudes of Two Places given, to find the Course and Distance between them.

Admit the Course and Distance between the Lizard, in Latitude $50^{\circ} 10' N.$ and Antego in Latitude $17^{\circ} 25' N.$ whose Difference of Longitude is $54^{\circ} 15' W.$ be required.

From $50^{\circ} 10'$ N. Lat. { Lizard } M. Pt. { 3490
Subtr. $17^{\circ} 25'$ } Antego { 1061

32 45
60

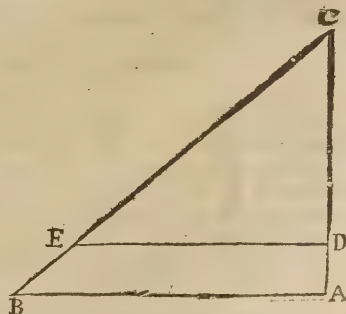
2429 = to

(Merid. Diff. Lat.

1965 = Diff. Lat. Diff. Long. = $54^{\circ} 15'$
(= 3255 Miles W.

Geometrically.

Draw the Meridian CA, which make equal to 2429, the Merid. Diff. Lat. Erect the Perpendicular AB, which let be equal to the Diff. of Longit. 3255; draw CB; make CD equal to the proper Diff. of Lat. 1965; and erect the Perpendicular DE.



In the } Given { CA = Mer. Diff. Lat. = 2429
Triang- } BA = Differ. Longit. = 3255
gle A } Requi- { $\angle C$ = Course.
BC } red { $\angle B$ = Compl. Course.

In the } Given { CD = Proper Diff. Lat. = 1965
Triang- } and $\angle C$ = Course.
gle C } Requi- { CE = Dist. of the Places.
DE } red {

O o o

For

For the *Course*, say,

As Mer. Diff. Lat. : Rad. :: Diff. Long. : T. Course
 2429 min. : T. 53° :: 3255 min. : T. 53° 16'

Operation by the *Logarithms*.

To the Arithmetical Complement of the Log Mer. } 2429 — 6.614573
 Diff. Lat. }
 Add the Log. of the Diff. Long. 3255 — 3.512551
 Sum is the T. of the Course, 53° 16' — 10.127124

By *Gunter's Scale*.

The Extent from . . 2429 } on the Line of
 to . . 3255 } Numbers.
 Will reach from T. 45° 00' } on the Line of
 to the T. of the }
 Course . . . } 53 16 } Tangents.

For the *Distance*, say,

As the Co-Sine of the Course : Rad. :: D.L. : Diff.
 S. 36° 44' : S. 90° 00' :: 1965 : 3285.

Operation by the *Logarithms*.

To the Arithmetical Complement of the Co. S. } 36° 44' — 0.22323
 Course - - - }
 Add the Log. of the Diff. Lat. 1965 — 3.29336
 Sum is the Log. of the Distance, 3285 — 3.51659

By *Gunter's Scale*,

The Extent from S. 36° 44' } on the Line of
 to the - - - S. 90° 00' } Sines.
 Reaches from — S. 1965 — } on the Line of
 to - - - - - 1965 — } Numbers.

PROBLEM IV.

4. The *Latitude* and *Course* given, the *Distance*, *Difference of Longitude* and *Departure*, required.

Example.

Sailing from the *Lyard*, Lat. 50° 10' N. and the Course being 53° 16' S. Westerly (Variation and Leeward-way, &c. allow'd for) or S. W. $\frac{3}{4}$ W. near; and finding by Observation the Ship to be in Latitude 17° 25' North; What's the *Distance run*, *Departure*, and *Difference of Longitude*?

From 50° 10' N. } Lat. { *Lyard* } M.Pt. { 3490
 Subst. 17 25 N. } Lat. { observ'd } 1061

Rem. 32 45 = 1965 = Diff. Lat. M. Diff. Lat. 2429

Distance, what?

As the Sine of the Course : Rad :: Diff. Lat. : Diff.
 and 36° 44' : S. 90° 00' :: 1965 : 3285.

Departure, what?

Radius : Mer. Diff. Lat. :: T. Course : Diff. Long.
 T. 45 : 2429 min :: T. 53° 16' : 3255 min.

Operation by the *Logarithms*.

To the Log. Mer. Diff. Lat. 2429 — 3.38542
 Add the Tangt. of the Course, 53° 16' — 10.12712

Sum = Log. Diff. Longitude, 3255. 3.51254

By *Gunter's Scale*.

The Extent from T. 45° } on the Line of
 to the Tangent of 53° 16' } Tangents.
 Reaches from - - - 2429 } on the Line of
 to - - - - - 3255 } Numbers.

PROBLEM V.

5. The *Latitude* and *Distance* being given, *Course*, *Departure*, and *Difference of Longitude* are required?

Example.

Sailing North-Eastward from *Antego* 3285 min: and by Observation finding my Latitude to be 50 deg. 10 min. North; What's the *Course*, *Departure* and *Difference of Longitude*?

From 50° 10' N. } Lat. { observ. } M.Pt. { 3490
 Subst. 17 25 N. } Lat. { *Antego* } 1061

32 45 = 1965 = Diff. Lat. M. Diff. Lat. 2429

Course, what?

Distance : Diff. Lat. :: Radius : Co-Sine Course,
 3285 : 1965 :: S. 90° 00' : S. 36° 44'

Operation by *Logarithms*.

To the Arithmetical Complement of the Log. of } 3285 — 6.48341
 the Distance - - - }
 Add the Log. of the Diff. Lat. 1965 — 3.29336

Sum = Co-Sine of the Course, 36° 44' — 9.77677

By *Gunter's Scale*.

The Extent from Distance 3285 } on Line of
 to the Diff. Lat. - - - 1965 } Numbers.
 Reaches from S. of Radius, 90° 00' } on Line of
 to the S. Compl. of Course 36 44 } Sines.

Then the { *Departure* } is found by Prob. I. II.
 { *Diff. Longit.* }

PROBLEM VI.

6. The *Latitude* and *Departure* given, *Required* the *Course*, *Distance*, and *Difference of Longitude*.

Example.

A Ship from Latitude 50° 10' N. and Longitude 00° 00' runs South-Westerly 'till her *Departure* be 2633 Miles, and the observed Latitude 17° 25' North; I demand the *Course*, *Distance* and *Difference of Longitude*?

Diff. Lat. : *Departure* :: Radius : T. Course. 1965
 : 2633 :: T. 45° 00' : T. 53° 16'

Operation

Operation of the Logarithms.

To Ar. Co. Log. of Diff. Lat. 1965—6 70664
Add the Log. of Departure 2633—3.42048

Sum = T. of the Course — 53° 16'—10.12712

By Gunter's Scale.

The Extent from Diff. Lat. 1965 { On Line of
to the Departure 2633 } Numbers.
Reach. from T. of Radius, 45° 00' { On Line of
To the T. of the Course 53 16 } Tangents.

Then { Distance
Differ. Longit. } is found by *Prob. I. II.*

P R O B L E M VII.

7. *One Latitude, Course and Distance given; the Difference of Latitude, and Difference of Longitude required.*

Example.

A Ship from 50° 10' N. Latitude, and 00° 00' Longitude, runs with a Course 16° 32' S. westerly 3285 Miles: What is the Difference of Latitude, and Difference of Longitude?

For the *Difference of Latitude*, say,

Radius : Co-Sine Course :: Distance : Differ. Lat.
S. 90° 00' : S. 36° 44' :: 3284 m : 1965.

Operation by the Logarithms.

To the 7, of the Course 53° 16'—9.77676
And the Logar. Distance 32 85 —3.51659

Run = Log. Diff. Lat. 19 65 —3.29335

By Gunter's Scale.

The Extent from S. Radius, 90° 00' { On Line of
To the S. Compli. Course 36 44 } Sines.
Reaches from the Distance 32 85 { On Line of
To the Differ. Latitude 19 65 } Numbers.
From 50° 10' = Departed { Lat. Mer. Pts. { 3490
Subst. 32. 45 = Differ. } 1061

Rem. 17. 25 = Present } Mer. Diff. Lat. = 2429

Diff. Long. find by *Prob. 2.* in 3255 = 54° 15' W.

From 54° 15' = Difference
Subst. 00 00 = Departed } Longitude.

Rem. = 54° 15' W. Present

P R O B L E M VIII.

8. *One Latitude, Departure and Course given: Required Distance, Difference of Latitude, and Difference of Longitude.*

Example.

Sailing South 53° 16' West, from Latitude 5° 10' North, Longitude 00° 00', till my Departure be 2633 Miles: What's my Distance, Latitude and Longitude?

Distance { by C. 6. of *Plain Sail*. is { 3285
Diff. Lat. { 1965 = 3245

From 50° 10' N. = Departed
Subst. 32 45 N. = Difference } L.M.P. { 3490
Rem. = 17 25 = 1985 X Pref. } M.D. Lat. 2429

For the *Difference of Longitudes*, say,

Proper Diff. Lat. M.R. Diff. Lat. : Depart. D. Long.
1965 m : 2429 m :: 2633 : 3255

Operation by Logarithms.

To Ar. co. Log. Diff. Lat. 1965 —6.70663
Add the Log. { Mer. Diff. Lat. 2429 —3.38542
Departure 2632 —3.42049

Sum = Log. Diff. Long. 3255 = 54° 15' 3.51254

By Gunter's Scale.

The Extent from Diff. Lat. 1965 }
To the Mer. Differ. Lat. 2429 } on Line of Num.
Reaches from Departure 2633 }
To the Differ. of Long. 3255 }

From 00° 00' = Departed
Subtract 54 15 = Difference } Longitude.
Rem. = 54 15 W. = Present.

P R O B L E M IX.

9. *One Latitude, Distance and Departure given: The Course, Difference of Latitude, and Difference of Longitude required.*

Example.

From Latitude 50° 10' N. and Longitude 00° 00', Sailing South Westward 3285 m. until the Departure be 2633 m: I demand the Course sail'd, Latitude and Longitude.

By C. 4. of *Plain Sailing* { Course = 53° 16' W.
Diff. L. = 1965

By *Prob. 6.* Present Latitude = 17° 45' N.
And Meridian Differ. Latitude = 2429

Difference } Long. by *Prob. 6.* is { 3255 = 54° 15'
Present } 54 16

P R O B L E M X.

10. *One Latitude, Course and Difference of Longitude given: The Difference, Latitude, Distance and Departure required.*

Example.

From Latitude 53° 10' N. sailing South 53° 16' Westerly, till I am in the Longitude 54° 45' W. What's my Distance, Departure and Difference of Latitude?

From 00° 00' N. Departed
Subtract 54 15 W. Present } Longitude.
Rem. = 54 15 = 3255 = Differ.
O o o 2

For

For the Meridian Difference of Latitude, say,

Radius : c T. Course :: Diff. Long. : Mer. Diff. Lat.
T. 45° : T. 36° 44' :: 3255 : 2429 m.

Operation by the *Logarithms*.

To the c T. Course — 36° 44' — 9.87290
Add Log. Diff. Longit. 3255 m. — 3.51255

Sum Rad. = Log. Mer. Diff. Lat. 2529 m. 3.38545

By *Gunter's Scale*.

The Extent from T. Radius 45° } on Line of Tan.
To T. Compl. Course — 36° 44' }
Reaches from Diff. Long. 3255 } on Line of Num.
To Merid. Differ. Latit. 2429 }

From 3490 } Parts in Dep. } 50° 10'
Subst. 2429 } Mer. Difference } Lat. North.
Rem. 1061 } Parts in pref. } 17 25
Then find the Distance and Departure, by
Case 2. Plain Sailing.

PROBLEM XI.

11. The Difference, Longitude and Distance of two Places in the same Latitude being given, to find the Latitude.

Example.

Two Ships in the Equator 400 Miles from one another; one fails North, the other South alike Distances, till they are 150 Miles asunder: What Latitude are they in?

Proportion.

Differ. Long. : Radius :: Distance : S. Latit.
400 : S. 90° 00' :: 150 M. : S. 22° 01'

Operation by the *Logarithms*.

To the Ar. co. Log. Diff. Long. 400 — 7.39794
Add Logarith. of the Distance 150 — 2.17600

Sum = S. Latitude — 67° 59' — 9.57394

By *Gunter's Scale*.

The Extent from Differ. Long. 400 } on Line of
To the Distance 150 } Numbers.
Reaches from S. Radius 90° 00' } on Line of
To S. Compleat Latitude 67 59 } Sines.

PROBLEM XII.

12. The Differences of Longitude between two Places of the same Latitude, being given: To find their Distance.

Example.

The Distance between *Martinico*, and *Cape Verde*, is required.

From 54° 50' } = Long. { *Martin.* } L. 14° 50'
Subst. 11 30 } { *C. Verde.* } North.

Rem. = 43 20 = 2600 Miles = Differ. Long.

Radius : Diff. Long. :: S. Latit. : Distance.

Operation by the *Logarithms*.

To Log. Differ. Longitude 2600 — 3.41497
Add the S. Latitude 14° 50' — 9.91528

Sum — Rad = Log. Distance 2513 — 2.40025

By *Gunter's Scale*.

The Extent from S. Rad. 90° 00' } on Line of
To the S. Com. Latitude 75 10 } Sines.
Reaches from Differ. Longit. 2600 } on Line of
To the Distance — 2513 } Numbers.

PROBLEM XIII.

13. The Distance between two Places in the same Parallel given: Required, To find the Difference of Longitude.

Example.

Sailing from *Cape Verde*, in Latitude 14° 50' North to an Island 2513 Miles West: I demand the Longitude of the Island.

c S. Lat : Distance :: Radius : Diff. Long.
S. 75° 10 : 2513 :: S. 90° 00' : 2600 Miles

Operation by the *Logarithms*.

To ar. co. S. Latitude 14° 50' — 6.01472
Add Log. of the Distance 2513 — 3.40025

Sum = Log. Diff. Long. 2600 Miles — 3.41797

By *Gunter's Scale*.

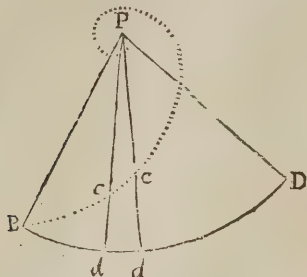
The Ext. from S. Compl. Lat 75° 10' } on Line of
To the Sine of the Radius — 90 00 } Sines.
Reaches from Distance — 2513 } on Line of
To the Difference of Longitude — 2600 } Numbers.

To 2600 | = 43° 20' = Diff. Long. in D. and M.
Add 60 | 11 30 = Long of *Cape Verde*.

Sum = 54. 50 = Longitude of the Place the Ship is in.

That the *Meridian Line* in *Mercator's Chart*, is a Scale of *Logarithmick Tangents* of the half Complements of the Latitude: The incomparable *Mr. Halley* demonstrates thus.

Supposing P the Pole.
B D the Equinoctial.
P C, P c, &c. Co-Latitudes.
B c c, C P a Rhumb Line.



1. The Lines PB , Pc , PC , are the Tangents of half the Co-Latitudes in the Stereographick Projection, (by Prob. 1. in *Spherick Projection*.)

2. The Difference of Longitudes, or Angles at the Pole (BPC , &c.) between them, are Logarithms of the Ratios of those Tangents one to another, (by the known Property of *Proportional Spirals*.) But the *Nautical Meridian Line*, is no other than a Table of Longitudes, answering to each Minute of Latitude on the Rhumb Line, making an Angle of 45 Degrees with the Meridian: Wherefore the Meridian Line is no other than a Scale of Logarithmick Tangents, of the half Complements of the Latitudes. *Q. E. D.*

Whence he deduces the following

COROLLARIES.

1. Because that in every Point of any Rhumb Line, the Difference of Latitude is to the Departure as the Radius to the Tangent of the Angle that Rhumb Line makes with the Meridian; and those equal Departures are every where to the Difference of Longitude, as the Radius to the Secant of the Latitude: It follows, that the Differences of Longitude are on any Rhumb, Logarithms of the same Tangents, but of a different Species; being proportioned to one another, as are the Tangents of the Angles made with the Meridian.

2. Hence any Scale of Logarithmick Tangents is a Table of the Differences of Longitude, to several Latitudes, upon some determinate Rhumb or other: And therefore, as the Tangent of the Angle of such Rhumb, to the Tangent of any other Rhumb; so the Differences of the Logarithms of any two Tangents, to the Difference of Longitude on the proposed Rhumb, intercepted between the two Latitudes, of whose half Complements you took the Logarithmick Tangents.

MERCATOR'S Sailing, is the Art of finding on a Plane the Motion of a Ship upon any assign'd Course, true in Longitude, Latitude and Distance; the Meridians being all parallel, and the Parallels of Latitude Strait Lines. The Way to do this, you have before in *Mercator's Chart*.

MERCURY, according to the Chymists, is the Third of their *Hypoastatical Principles*; and is the same with what we call Spirit; which see.

MERCURIES of Metals, are Things much boasted of by the Chymists; but they deliver the Processes of making them so obscurely, that we have just Reason to believe they had no Mind to be disproved by being understood.

Yet Mr. Boyle tells us expressly, that he shewed a certain Chymist of his Acquaintance a Way

to draw a true Running Mercury, or Quick-silver, from Antimony; and that it succeeded well.

MERCURIUS Dulcis, or Sweet Sublimate of Mercury, by the Chymists sometimes called *Aquila alba*, is thus made. Sixteen Ounces of Sublimate Corrosive being powder'd in a Glass, or Marble Mortar, for it must never be done in a Metalline one) is mixed by little and little with Twelve Ounces of Mercury revived from Cinnabar, (or pure Mercury): The Mixture is stirred about with a Wooden Pestle, till all the Crude Mercury disappear; then it is put into a Matraass, two Thirds of which remain empty: The Vessel is heated in Sand, gently at first, but afterward the Fire is increased to the Third Degree. In four or five Hours the Sublimate will stick to the Top and Neck of the Glass: Fling away all that is not White, and then powder that, and sublimate it again, and a Third time, if you would have it very white. Thus is the strongest Poison, perhaps in Nature, corrected into a very gentle and useful Medicine, by adding more Mercury to it. The Reason of which seems to be, That by these New Sublimations, the Corroding Acids of the Sublimate have their Points broken, and perhaps some of them loaded with the Addition of more Mercury, and so can't act with the same deleterious Force as they did before.

MERCURIUS Vita. See *Algorot*.

MERCURY. According to *M. Cassini*, the greatest Distance of Mercury from the Earth is 32704, the mean Distance 22000, and the least Distance 11256 Semi-diameters of the Earth: Therefore his mean Distance will be about 88000000 English Miles; and the Diameter of Mercury is $\frac{2}{3}$ of the Diameter of the Earth, and therefore the Globe of Mercury must be $\frac{2}{3}$ of that of the Earth.

Mr. Azout pretends to prove, That tho' Mercury be so near the Sun, the Light there is not capable of burning any Objects. But Sir Isaac Newton makes the Heat of Mercury so great, as to be Seven times as much as the Heat of our Summer Sun; which he found by Experiments designedly made by the Thermoscope, is enough to make Water boil. And therefore if Bodies will not be there enkindled by such a Degree of Heat, it must be because their Degree of Density is proportionably greater than that of such kinds of Bodies on our Earth: Wherefore undoubtedly this Fiery Planet is uninhabitable by such Creatures as live on our Earth.

Capt. Halley, in his Observation of Mercury seen in the Sun, A. D. 1677, at St. Helena, saith, That this Planet may be seen Nine times in the Sun, near the Ascending Node, A. D. 1710, 1723, 1736, 1743, 1756, 1769, 1776, 1782, 1789, in October; and Four times near the other Node, in the Month of April, A. D. 1707, 1753, 1786, 1799; all within this Century.

Dr. Gregory, in his Comparative Astronomy, at the End of his *Astron. Phys. & Geom. Elementa*, considers what *Phænomena* in the Heavens would appear to an Eye placed in this Planet Mercury, viz.

2. That the Diameter of the Sun seen from thence, would be treble of what it is seen from the Earth, because that Planet is thrice as near to it as we are; and consequently the Sun's Disk to an Eye there, will be Seven times as great as what

it appears to us ; and all other things consider'd, the Light and Heat in *Mercury* will be septuple of ours, at some times : But these Qualities will be much intended and remitted, according to the diverse Distance of *Mercury* from the Sun ; for his Orbit is the most Excentrick of any of the Planets.

2. The Gravity of *Mercury* towards the Sun will be seven times greater than in the Earth. The Density of *Mercury*, and consequently the Gravity of Bodies placed on its Surface, towards its Centre, cannot so accurately be determin'd, as the Gravity of the Planet towards the Sun : But however, in *Prop. 49. Lib. 3. Schol.* he shews a Way to guess Analogically at it. And no doubt this Planet is much denser than the Earth, because of the Over-proportion of Heat there.

3. It doth not yet appear by Observations, whether *Mercury* revolves round his Axis, or not, and consequently what the Length of his Day is ; but 'tis probable he hath such a Motion as well as the other Planets, but his Year is scarce equal to a Quarter of ours. What Variety of Seasons and Weather *Mercury* is subject to, is uncertain ; because the Inclination of his Axis, on which he revolves about himself, to the Plane of the Orbit, which he describes round the Sun, is unknown.

4. To an Eye placed in *Mercury*, and looking towards the Sun, the Solar Spots (if at any time such there are) will appear to traverse his Disk sometimes in a Right-Line, from East to West ; and sometimes their Path will appear Elliptical, bending sometimes one way, and sometimes another. And the whole Variety of this Appearance will be absolv'd in a Year's Time, in which the Path of the Solar Spots will appear to be twice Rectilinear : But indeed the Path of these Spots will be almost continually in a Right Line, because *Mercury* never much declines from the Plane of the Sun's Equator.

5. The other Five Planets being above *Mercury*, their Phenomena will be much the same as to an Eye at the Earth : So that *Venus* and our Earth, when in Opposition to the Sun, will shine with a full Orb, and consequently afford a great Light to this Planet at Night. But the Superior Planets will not afford him so much Light as they do us.

6. The Sun's and the other Planets Places, and the Phenomena of Comets are found the same Way in *Mercury*, and after the same manner, and will appear as they do to us on the Earth.

MERIDIAN, is a great Circle passing through the Poles of the World, and both Zenith and Nadir, crosseth the Equinoctial at Right Angles, and divideth the Sphere into two equal Parts, one East, the other West ; and has its Poles in the East and West Points of the Horizon. 'Tis call'd *Meridian*, because when the Sun cometh to the South Part of this Circle, 'tis then *Meridies*, Mid-day, or High-noon ; and then the Sun hath his greatest Altitude for that Day, which therefore is called the *Meridian Altitude*.

These *Meridians* are various, and change according to the Longitudes of Places ; so that they may be said to be infinite in Number, for that all Places from East to West have their several *Meridians* : But there is (or should be) one Fix'd, which is called the *First Meridian*.

MERIDIAN on the Globe or Sphere, is represented by the Brazen Circle, in which the Globe hangs and turns. 'Tis divided into Four 90's or 360 Degrees, beginning at the Equinoctial.

On it, each way from the Equinoctial, on the *Celestial Globe*, is counted the South and North Declination of the Sun or Stars : And on the *Terrestrial Globe*, the Latitude of Places North or South. Which is all one with the Elevation or Height of the Pole above the Horizon ; and the Complement of the Latitude or Poles Height is equal to the Height of the Equinoctial above the Horizon.

There are two Points of this Circle, which are called the Poles of the World ; and a Diameter continu'd from thence through the Centre of either Globes, is called the Axis of the Earth or Heavens, on which they are supposed to turn round.

On the *Terrestrial Globes* there are usually 36 *Meridians* drawn, one through every Tenth Degree of the Equator, or through every Tenth Degree of Longitude.

The Uses of this Circle, are,

1. To set the Globes to any particular Latitude.
2. To shew the Sun's or a Star's Declination, Right Ascension, or greatest Altitude, &c.

PROBLEM.

To find the Sun's Meridian Altitude or Depresson at Night by the Globes.

Bring the Sun's Place to the *Meridian* above the Horizon, for his *Noon-Altitude* ; which will shew the Degrees of it, counted from the Horizon. For his *Midnight-Depresson* below the North Point of the Horizon, you must bring the opposite Point to the Sun's present Place, as before to the *Meridian* ; and the Degrees there intercepted between that Point and the Horizon, are his *Midnight-Depresson*.

MERIDIAN Line, on a Dial, is a Right Line arising from the Interfection of the Meridian of the Place with the Plane of the Dial. This is the Line of 12 a Clock, and from hence the Division of the Hour Lines begins.

To draw a True Meridian Line upon an Horizontal Plane.

First, Get a plain thick Board, of a Foot Square, or more ; then upon one of the Edges or Corners, as near as may be, fasten a strong Iron Pin, about 10 or 11 Inches long, and make it so fast, that it will not shake or yield in the least : It matters not whether it be perpendicular or not.

Set this Board horizontally in your Garden with Earth or Sand upon the Ground, or elsewhere about 9 a Clock ; (the best Time is, when the Sun is near the Solstice, suppose about the 10th of June) see where the Head of this Iron Pin (which must be sharp at the top) giveth its Shadow upon the Board, mark that Place : Then take a Wooden Ruler, sharp also at one end, and lay it so upon the sharp end of the Iron Pin, that the sharp end of the Ruler may touch the Mark ; then carrying it steady, make the Segment of a Circle towards the North. Come again about 3 a Clock in the Afternoon, and mark where the Shadow of the top of the Iron Pin is, in that Segment again. Then draw a Line from those two Marks, which will be East and West, and the Perpendicular to that Line will be a *Meridian* ; and if you halve that Line, the Perpendicular will go through the Centre of the whole Circle : For that Segment is part

part of the Basis of a Cone, whose Vertex is the Top of the Iron Pin.

But because the Sun may be under a Cloud, when you come at Three a Clock, you may make three or four more Segments, and use them as you used this.

This Method would be very exact, if the Sun moved as the Fixed-Stars do; but because the Sun hath a proper Motion, as a Planet, there will be some inconsiderable Error, which yet may be corrected; For seeing the Sun in one Minute of an Hour moveth as much by his daily Motion, as he loseth in 6 Hours by his proper Motion; you shall add as much in the way which the Shadow goes in the last Mark, as that Shadow moveth in one Minute, which you may measure by your Pulse or Pendulum; so the last Point will not be taken just in the Segment, but a little without it.

Under the Word *Pole-Star*, you have another good Method for drawing a true *Meridian Line*.

Mr. Stephen Gray, in *Philos. Transact.* N^o 260, gives a New Method of drawing a True *Meridian Line* by the *Pole-Star*; as also, How to find the Hour by the same. Thus,

Take the Gnomon of an Horizontal Dial for the Latitude of the Place, and to the Hypothense fix two Sights, whose Centres may be parallel to the same: Let the Eye-sight be a small Hole; but the other's Diameter must be equal to the Tangent of the double Distance of the North-Star from the Pole, the Distance of the Sights being made *Radius*. Let the Stile be rivetted to the End of a straight Ruler; then when you would make use of it, lay the Ruler on an Horizontal Plane, so that the End to which the Ruler is fix'd, may hang over: Then look through the Eye-sight, moving the Instrument 'till you see the North Star appear to touch the Circumference of the Hole in the other Sight, on the same Hand with the Girdle of *Cassiopeia*; or on the opposite side to that, whereon the Star in the Great Bear's Rump is at that Time: Then draw a Line by the Edge of the Ruler, and 'twill be a True *Meridian Line*, as is very easie to demonstrate.

In *Philos. Transf.* N^o 270, he improves this Method, and describes an Instrument, whereby he not only draws a True *Meridian*, but finds the Hour and Minute of the Day or Night, by the Help of the *Pole-Star*, exactly. His Instrument he thus describes:

Let there be taken a Telescope, of about 16 Foot, or longer, if you please; in the Plane of its Focus, place a Ring of Brass at Right Angles to the Glass, the Diameter of the inward Circle being equal to the double Tangent of the *Pole-Star's* Distance from the Pole; the Focal Length of the Object-Glass being made *Radius*, as was said in the Description of the *Meridian Instrument*. Let the Ring be divided into 24 Hours, with their Minutes, numbred from the Right Hand towards the Left, as in our common Nocturnals: The Eye-Glass must be equal in its Diameter to the Horary Ring. But this perhaps will be thought too chargeable, especially for such large Telescopes as he speaks of; wherefore he gives this Contrivance: The Eye-Glass must lie in a broad Index, towards one End; this is to turn on a Centre-pin that lies in the Centre of the Glass, and consequently over the Centre of the Horary Ring, from which it must be equal to the Distance of the Focus of the Eye-Glass; then let the

Tube be elevated to the Height of the Pole, and directed to the *Pole-Star*, 'till by turning the Index about, you can perceive the Star to touch the Horary Ring on that side the Star in which the Great Bear's Rump lies, or on the opposite to that in the Hip of *Cassiopeia*: But on the contrary, had not the Glass inverted the Object, then bring one of the Twelves to be in a Perpendicular to the other; by a plain Line; so will the Star stand at its Horary Distance from the *Meridian*: Or if the Latitude of the Place be unknown, by the Right Ascension of the Sun and Star, the Time of its coming to the *Meridian* will be easily obtain'd, then the Hour of the Night found, will as easily give the Star's Horary Distance from the *Meridian*. Then elevate the Tube towards the Star, bringing the *Meridian*, or 12 and 12, into the Plane of the Perpendicular; turn the Glass about, 'till you see the *Pole-star* stand at its Horary Distance from the *Meridian*; so will the Instrument, when fix'd, shew the Horary Distance throughout the whole Day, or as long as it remains in this Position, by the apparent Motion of the Star in the Ring.

The best Time to fix the Instrument, will be when this, or any of the other two Stars above-mention'd; are about 6 Hours from the *Meridian*.

Note, That the Latitude of the Place is now given with the utmost Preciseness; for the Axis of the Glass lies now in the Axis of the World; and if one of the sides of the Tubes be parallel thereto, as it ought to be, at the upper End hang a Line or Plumbet, from the Point of Suspension; find another Point equal in Distance to the Length of the Line, or a Knot towards the lower End, the Distance from this Knot to the former Point will be but the Chord of the Latitude; and if from the same Edge of the Index another Line and Plumbet be hung towards the lower End of the Tube, these two Lines, when at rest, will be in the Plane of the *Meridian*.

This Instrument may be made to shew the Hour with as much Facility as a Clock or Sun-Dial, if the Horary Ring be made to move within a larger fixed one; and the outward Circle of the former be divided into the Days of the Month, respect being had to the Right Ascension of the Sun and Star; Then bringing the two opposite Points in the fixed Circle, to the Perpendicular, which is done at the fixing of the Instrument, move the Circle 'till the Day of the Month come to any of these, and the Ring is rectified for that Day; and if the Air be clear, you'll see the Star stand at the true Time of the Day or Night.

It may be objected, That in few Years, by the Annual Increase of its Declination, the *Pole-star* will, by moving in a lesser Circle, be brought too far from the Edge of the Ring, that the exact Hour and Minute cannot well be distinguished. But this Inconveniency, when it is one, may be remedied several ways; either by making a lesser Ring, or by extending a fine Thread of Silk cross the Ring, 'till it cuts the Star, and at the same time it gives the Hour; or, which will yet make this Instrument commodious for other Purposes, there may be made an Index to move on the Centre of the Hour-wheel, which being brought to cut the Star with the Edge that proceeds from the Centre, it will at the same time cut the Hour. And you need not be solicitous about the exact Diameter of the Ring, provided

it do but a little exceed the Distance of the Pole-Star from the Pole; the Focal Length of the Glass being made Radius.

Our most Accurate and Judicious Astronomer, Mr. John Flamsteed, has discovered, That there is a Parallax of the Earth's Annual Orbit at the Pole-star, of about 40 or 45 Seconds; whereby the Diameter of the Star's Parallel is greater in June than in December, by about one Minute two Seconds; which he has evinced from 7 Years successive Observations: Whereby the Earth's Annual Motion is indubitably demonstrated, as appears from his Learned Letter to Dr. Wallis on that Subject.

Now if on the Edge of this Index there be drawn a Scale of Degrees, Minutes and Seconds, to the Radius of the Glass, we shall not only have a very Accurate Instrument for the Hour, but be furnished with one whereby we shall see the Truth of the Earth's Motion confirmed by the Accels and Recess of our Star towards and from the Pole, according to the Earth's Place in the Ecliptick, as that learned Person above-mentioned has discover'd; and that not only when the Star transits the Meridian, but in a clear Air at any Time of the Day: One shall likewise observe that Annual Increase of the Pole-stars Declination, caused by the Profection of the Equinox.

Moreover, he, from his own Observation, assures us, That the Pole-star may be seen in the Day-time with a Telescope of 16 Foot; of which he gives particular Instances: As, On the 26th of April, 1701, with such a Telescope he saw the Pole-star from four a Clock in the Morning, 'till seven; and could have seen it longer, had not Clouds interpos'd. Also, On the 1st of May, he did not look for the Star 'till the Sun had been up more than half an Hour, viz. at Five in the Morning, yet soon found it; and saw it afterwards at Pleasure, 'till half an Hour after Nine the same Morning. So that 'tis not to be doubted, but this Star may be seen in a Clear Day throughout the Year.

The Declination of the Pole-star for the Year 1700, is $87^{\circ} 42' 51''$ by Riccioli's his Catalogue of Fixed Stars, in the Appendix to Mr. Edward Sherburn's *Sphere of Manilius*, &c. Hence its Distance from the Pole at that Time might be assumed $2^{\circ} 17'$ the Focal Length of the Object-glass being 15 Foot 6 Inches; so that the Diameter should be 14 Inches and $\frac{84}{100}$ Parts of an Inch, which is the natural Tangent of the former Ark $2^{\circ} 17'$ doubled; a Circle large enough to be divided into Minutes and Halves, which will be so magnified by the Eye-glass, that 'twill be easie to distinguish the Time to a few Seconds.

'Tis true, there is some Difficulty in fixing up this Instrument; and when it is so, to keep it from varying from its due Position; but yet 'tis not insuperable. And for small Instruments, of about 2 or 3 Foot long, there cannot be a more accurate, facile, and expeditious Way than this for drawing a Meridian Line.

Now whether the many Benefits that may accrue to Astronomy, do not make the larger one worthy of the Charge and Trouble that may be in completing it, he leaves to the Consideration of the Learned.

MERIDIAN *Magnetical*, is a great Circle passing thro' or by the magnetical Poles; to which Meridians, the Compass (if not otherwise hindred) hath respect.

MERIDIONAL *Distance*, in Navigation, is the same with the Departure, Easting or Westing, of the Difference of Longitude between the Meridian under which the Ship now is, and any other Meridian she was before under.

MERIDIONAL *Parts*, Miles, or Minutes, in Navigation, are the Parts by which the Meridians in Mr. Wright's Chart (commonly, though falsely, called *Mercator's*) do increase as the Parallels of Latitude decrease: And the Co-sine of the Latitude of any Place being equal to the Radius or Semi-diameter of that Parallel, therefore in the True Sea Chart, or Nautical Planisphere, this Radius being the Radius of the Equinoctial, or whole Sine of 90° ; the Meridional Parts at each Degree of Latitude must increase, as the Secants of the Ark contained between that Latitude and the Equinoctial do decrease. The Tables therefore of Meridional Parts, which you have in Books of Navigation, are made by a continual Addition of Secants: They are calculated in some Books (as in Sir Jonas Moor's Tables) for every Degree and Minute of Latitude; and these will serve either to make or graduate a *Mercator's Chart*, or to work the *Mercator's Sailing*. To use them, you must enter the Table with the Degree of Latitude at the Head, and with the Minute on the first Column towards the Left Hand; and in the Angle of Meeting you will have the Meridional Parts.

Having the Latitudes of two Places, to find the Meridional Miles or Minutes between them, consider whether the Places be one under the Equinoctial and the other wide thereof; or the one on the one side of the Equinoctial, and the other on the other; or whether they both lie on the same side: For, according to these Positions, there's a Threefold Case.

1. When one Place lieth under the Equinoctial, then the Meridional Minutes that are found next under the Degree of Latitude the other Place lieth in, is the Meridional Difference of Latitude, or Latitude enlarged.

2. When one Place hath North Latitude, and the other South, add the Meridional Minutes belonging to each Latitude together, and the Sum is the Meridional Minutes between them.

3. When both Places are towards one Pole, then subtract the Meridional Parts answering to the lesser Latitude, out of those for the greater, and the Remainder will be the Meridional Minutes required.

Examples of these Cases will make them more plain, which shall be these:

Example I.

To find the Meridional Parts or Minutes between the Equinoctial and Latitude $43^{\circ} 11'$.

In the Column under 43, and right against 11 Minutes in the Left Hand Column stands 2878.2, the Meridional Parts required.

Example

Example II.

Let it be required to find the Meridional Parts between $25^{\circ} 13'$ South Latitude, and $51^{\circ} 30'$ North.

Under 51° and against $30'$ is ——— 3616.8
Under 25° and against $13'$ is ——— 1564.3

The Merid. Parts between the two, are ——— 5181.1

Example III.

To find the Meridional Minutes between the Latitude's $32^{\circ} 15'$ North, and $53^{\circ} 23'$ North.

Under 53° and against $23'$ is ——— 3802.2
Under 32° and against $15'$ is ——— 2046.1

The Meridional Parts between the Latitudes proposed, are ——— 1756.1

MERLON, in Fortification, is that Part of the Paraper which lies betwixt two Embrasures, being from 8 to 9 Foot long on the side of the Cannon, and 6 on the side of the Field; as also 6 Foot high, and 18 thick.

MESARAICK Veins, arise from, or are rather enclosed in the Mesentery, being Branches of the Vena Porta.

MESARÆUM, the same with Mesenterium; whence its Vessels are called as well Mesaraick as Mesenterick.

MESENTERY, is the Membrane of the Peritoneum doubled, enriched with Glandules, Nerves, Arteries, Veins, Chyliferous and Lymphatick Vessels: It is in the middle of the Abdomen, and contains the Intestines in a wonderful manner. It has a great Glandule in the middle, called Pancreas Asellus; about which are several other less Glandules, to which the Milky Vessels of the first Rank tend, from the Intestines and Lymphatick Vessels, from the Liver and other Parts: From these Glandules again the Milky Vessels of the second Rank ascend to the Vessel that carries the Mass of Chyle, and discharge themselves into it. Blanchard.

MESENTERICK Arteries: The Upper of which is said to distribute it self among the small Guts; and the Under one to go to the lower Part of the Mesentery.

MESN, or Mesn, a Term in Law, signifying him that is Lord of a Manor, and so hath Tenants holding of him; yet himself holds of a Superior Lord. It signifies also a Writ, which lieth where there is Lord, Mesn and Tenant: The Tenant holdeth of the Mesn by the same Services whereby the Mesn holdeth of the Lord; and the Tenant of the Mesn is distrain'd by the Superior Lord, for that his Service or Rent which is due to the Mesn.

MESOCOLON, is that Part of the Mesentery which is continued to the Great Guts, lying in the midst of the Gut Colon, whereto it is joined in its whole Course, and in its lowest Border sticks to a Part of the Rectum.

MESOLABIUM, in Mathematicks, is an Instrument for finding Mean Proportionals.

MESOPLEURII, are the Intercoastal Muscles, Twenty two on each side; Eleven External, and as many Internal.

METACARPUS, and Metacarpium, is the Back of the Hand, made of Four oblong little Bones, which expand the Palm of the Hand, and they are called *Post-brachialia*.

METACARPUS, is a Bone of the Arm, made up of Four Bones which are annexed to the Four Fingers; that which sustains the Fore-finger is the biggest and longest. They are round and long, a little convex and round towards the Back of the Hand, and concave and plain towards the Palm: They are hollow in the middle, and full of Marrow; they touch one another only at their Extremities, leaving Spaces in their middle, in which lie the *Musculi interossei*. In the upper end there is a Sinus, which receives the Bones of the Wrist, and their lower Extremity is round, and is received into the Sinus of the first Bones of the Fingers.

METACONDYLI, are the utmost Bones of the Fingers.

METALS and Minerals. The Excellent Promoter of all useful Learning, Bishop Wilkins, in his Real Character, gives the following Table of Metals.

Metal is a Mineral, for the most part of a Hard Consistence, Close, Ductile, and Fusile; and may be distinguished into

I. Perfect.

And this is either, { Natural, or
Fabricitious.

II. Imperfect.

With Reference to { Metalline Kinds, or,
Recrementitious Parts.

First, Natural Metals are such as of themselves grow in the Earth, without any kind of Mixture or other help by the Art of Men. And these are either,

i. More Rare and Precious: Of a

Yellowish Colour, most heavy; not growing in particular Mines, where it is debased with any drossie Mixture, but found pure either in small Sands, or rocky Branches; and this is Gold.

Whitish Colour, next in Value to Gold, not subject to Rust, yielding (when struck) a pleasant Sound; as Silver.

2. Of a Middle Value, and of a

Whitish Colour, and more soft Consistence, as Tin: Or of a Reddish Colour, as Copper.

3. Of a Baser Value, and more Common,

are

Lead, which is of a yet softer Consistence, a darkish Colour, and not Sonorous.

Iron, which is of an hard Consistence, and of a rusty dark Colour too.

Secondly, *Facitious Metals*, are such as are made by the Art of Man: Of which some are made of

Copper, and *Lapis Calaminaris*, as *Brass*. Some of
Tin, *Lead*, and *Tin-Glass*, as *Pewter*. Or of
Iron depurated, by frequent heating, and beating, and boiling with Salts; as *Steel*.

Thirdly, *Imperfect Kinds* of Metal, are either

Fluid, as *Mercury* or *Quicksilver*: Or,
Solid and *Consistent*. And some of these are used for

Purging, and chiefly upwards, as *Antimony*.

Some are used for making of
Pewter, being of a shining brittle Substance, as *Bismuth* or *Tin-Glass*. Others are used for making of

Solder, as *Spelter*, *Zink*, or *Spalt*. And some are made use for

Painting, as *Cinnabar*, *Vermilion*, and *Black Lead*.

Fourthly, *Recrementitious Parts* of Metals, are such as are cast off either in the *Preparation* of them by

Melting; as *Litarge*, which is a kind of Scum arising from the Purification of Silver from *Lead*; and *Spedium* and *Pomphelix*, which fly out from *Copper* when it is in Fusion, and either fall down again to the Ground, as the former, or adhere to the Roof or Walls, as the latter: Or else they come from the Metal by

Beating or *Hammering*, as the *Scoria*, or *Scales*; or arise from

Corruption either in the general way, as *Rust*, or after a particular manner, as in the making of *Verdigrease* and *Ceruse*; one from *Copper*, or *Brass*, and the other from *Lead*.

But notwithstanding this Scheme be a good general Summary; yet a good Discourse on this Subject is very much wanting; and indeed, to do it well, will be a very difficult Task: Because in the *Mineral Kingdom* (as Dr. Woodward observes in his Excellent Natural History of the Earth, Part 4.) there is nothing *Regular*, *Constant*, or *Certain*: Neither *Colour*, *Figure*, nor their *Place* or *Situation* in the Earth, are to be trusted to, or relied upon, so as positively to make any Judgment from thence.

A common *Marchasite*, or *Pyrites*, shall have the Colour and Brightness of Gold or Silver, and yet afford nothing but a little Sulphur and Vitriol; whilst another Body, having only the Resemblance of a Pebble or a Stone, shall have a plentiful Admixture of a valuable Metal in it.

Nothing is more common than to find the same Metal shot also into very different Forms and Figures; as well as to find different kinds of Metal of the same Form and Figure: And a Body which hath the shape and appearance of a Diamond, may prove upon Examination, to be nothing but Crystals or *Selenites*; nay, perhaps only common Salt, or Alum, naturally Crystallized, or shot into that Form.

So also as to their Place in the Earth, there is the same Uncertainty: Sometimes we find them in the Perpendicular Fissures, or Intervals of the *Strata*; sometimes interperfed in the Bodies of the *Strata*, and sometimes in both: Only indeed in the Gems there is this Difference, That the *Topazes*, *Amethysts*, *Emeralds*, &c. which grow in the Fissures, are ordinarily Crystallized or shot into Angular Figures, whereas those found in the *Strata*, are in rude Lumps, only like so many Yellow, Purple, or Green Pebbles; not but that even these that are thus lodged in the *Strata* are also sometimes found Crystallized, and in the Forms of *Cubes*, *Rhombi*, &c. but then those found in the *Strata*, are easily distinguished from the other, because they are without their *Roof*, (as the Jewellers call it) or the Abruptness at their Ends, whereby the others adhere to the Stone or Sides of the Intervals, which Abruptness is occasioned by their being broken off from thence: And those which are found inclosed in solid Stone, Marble, &c. being difficultly separable from the Stony Matter which adheres to them on all sides, have commonly some of that Matter sticking to them on all their sides; whereby they are distinguished from those found in the *Perpendicular Intervals*, they adhering only by one End, as was above observed.

The same Metals are also placed indifferently in all kind of Terrestrial Matter, or in *Strata* of very different Natures. They are frequently also variously intermixed one with another; so that 'tis a rare thing to find any of them Pure and Simple, but Copper and Iron shall be in the same *Mass*, Gold and Copper, Silver and Lead, Tin and Lead; yea, sometimes all the Six together in one and the same Lump.

'Tis the same thing with *Minerals*; and *Minerals* and Metals are very often Blended and Intermixed together.

Now the Knowledge of this may be of good use to undeceive those, who by reading of some Authors, are persuaded, That all things relating to Metals and Minerals, are transacted by Nature, in a most regular and Accurate Order, whereas indeed there is nothing like that; and the only standing Test, and distinguishing Characteristick of any Metal or Mineral, must be sought for in the Constituent Matter of it, and it must first be brought down to that, before any certain Judgment can be given of it.

Those Metals and Minerals which are repositied in the Bodies of the *Strata*, are either found there in Grains, or small Particles, or else amassed into Balls, Lumps, or Nodules; which Nodules are either of an irregular and uncertain Figure; as the common *Pyrites*, *Flints*, *Agates*, *Onyxes*, *Pebbles*, *Cornelians*, *Jaspers*, &c. or else they are of a Figure somewhat regular and observable; as the *Belemnites*, the several sorts of *Mineral Coral*, the *Stelechites*, the *Lapis Mucetoides*, vulgarly called, *Fungites*: The *Astroites*, or *Starry Stone*; as well that sort with the prominent, as that with the Concave Stars: The *Selenites*, the Echinated Crystalline Balls, with many more Analogous Bodies.

Those which are contained in the Perpendicular Intervals of the *Strata*, are either such as are there gathered into a Rude Heap, without any particular Form or Order, lying included within the two opposite Walls or Sides of the said Intervals,

vals, which, according to their Quantity, they wholly, or partly fill.

In such manner is *Sparr*, and other Minerals usually found; as also the common Ores of Lead, Tin, Iron, and other Metals: or else such as are distinguishable by being of some observable Figure; as the *Sparry Striae* or *Icecydes*, called *Stalactites*, or rather *Stagonites*; the Native *Saline Icecydes*, or *Sal Stalactitum*; the *Vitriolum Stalactitum Nativum*; the *Vitriolum Capillare*; the *Alumen Stalactitum* and *Capillare*; *Minera Ferri Stalactica*, which when several of the *Cylindrick Striae* are contiguous, growing together, as it were, in one Sheaf, is called *Brush Iron Ore*; the *Argentum Arborescens* and *Capillare*. To these add also the crystallized Ores and Minerals, viz. the Tin, and mundick Grains, the Iron Rhombs, crystallized Nitre, Salt, Alum, Vitriol and Sulphur: Of which sort also are the Gems or Stones that are here fluit into Cubes, into Pyramidical Forms, or into Angulated Columns, consisting of six Sides, and mucronated or terminating in a Point; being either *Opake* or *Pellucid*, or but partly so, and coloured Black, White, Grey, Red, Purple, Blue, Yellow or Green; v. gr. *Crystal*, the *Pseude-Adamantes*, the *Cornish* and *Bristol-Stones*, *Crystallized Sparrs*, the *Iris*, the *Amethyst*, the *Sapphire*, the *Topaz*, the *Emerald*, &c.

As to the Origin and Production of Metals and Minerals, the Doctor from the Light his Observations have given him, comes to these Conclusions.

1. That the far greatest Part of our Metals and Minerals, viz. all such as are now found in the *Strata*, do owe their present Frame and Order to the *Universal Deluge*, when the *Strata* of Stone, Earth, Marble, &c. themselves were also formed. At which Time also were all metallick and mineral Nodules whatsoever formed; as well those in rude Lumps, such as the common *Pyrites*, *Flints*, *Pebbles*, *Agates*, *Onyxes*, *Jaspers*, *Cornelions*, &c. as those of a more observable Figure and regular Shape; as the *Selenites*, *Belemnites*, *Stelechites*, mineral Coral.

2. That the metallick and mineral Matter, now found in the perpendicular Intervals or Fissures of the several *Strata*, of which the Body of the Earth is composed, was all of it originally, and at the Time of the Deluge, lodged in the Bodies of those *Strata*, that it was educed thence, and transmitted into these Intervals since that Time; the Intervals themselves not existing 'till the *Strata* were formed, and afterwards broken, to let the Water from off the Earth. See Part 2. *Consect.* 3, 6, and Part 3. *sect.* 2. of his *Natural History of the Earth*.

But he supposes, that the Water which is continually ascending from the Abyss, towards the Surface of the Globe (see *Abyss*, and the Word *spring*) continually pervading the Bodies of the *Strata*, detaches out of their Pores and Interstices, such metallick and mineral Corpuscles, as lie loose in its way (and which are withal so small as to be capable of passing thro' those Interstices) forcing them along with it to the perpendicular Intervals; where having more Room, and a freer Passage than before, it deserts them and leaves them in those Intervals; and that this way all the mineral and metallick Metals now found in these Places, were brought thither, and there do still grow and increase.

But that these in the *Strata* do not, nor cannot grow, but on the contrary, are continually lessened and diminished, by so much as hath been conveyed into their perpendicular Intervals, and hath been brought forth on the Surface of the Earth by Springs, Rivers, and Exhalations from the Abyss, ever since the Deluge.

The Doctor supposes also, That the *Bitumen*, which is found in Lumps, or coagulated Masses, in some Springs; and which in others is found floating on the Surface of the Water in the Form of an Oyl (called by Naturalists, *Naphtha* and *Petroleum*): That the Salt wherewith the *Saline* or Salt Springs abound, the Vitriol, Alum, Nitre, Sulphur, Sparr, and other Minerals, wherewith the *Acidule*, or medicinal Springs are impregnated; all these Minerals, he saith, were first lodged in the *strata* of Stone, Coal, Earth, &c. and have since been educed thence, and conveyed into those Springs, by the Water pervading those *Strata* in its Passage from the Abyss towards the said Springs. See a much larger Account of this Matter under the Word *Fossils*.

METAL, a Word frequently used about a Piece of Ordnance, or great Gun: The Outside or Surface of her is called, The *Superficies of her Metals*: When the Mouth of a great Gun lies lower than her Breech, they say, She *lies under Metal*; but if she lies truly level, point-blank, or right with the Mark, they say, She *lies right with her Metal*.

METALLURGY, is the Working or Operation upon Metals, in order to render them most fine, hard, bright, beautiful, serviceable or useful to Mankind.

METAPEDIUM, the same in the Foot that *Metacarpus* is in the Hand.

METAPHOR, a Trope in *Rhetorick*, by which we put a strange and remote Word for a proper Word, by reason of its Resemblance with the Thing of which we speak: As a King is called the Head of his Kingdom, because he commands the Members of the Politick Body, as the Head does the Natural Body.

METAPHRENUM, is that Part of the Back, which comes after the *Diaphragm*. *Blanchard*.

METAPTOSIS, is the degenerating of one Disease into another, as of a *Quartan Ague*, into a *Tertian*; and on the contrary, of an *Apoplexy* into a *Palsie*, &c.

METASTASIS, is when a Disease goes from one Part to another; which happens to Apoplectick People, when the Matter which affects the Brain is translated to the Nerves.

METATARSUS, is composed of five little Bones, connected to those of the first Part of the Foot, which immediately succeeds the Leg.

METEORS, (according to the *Cartesians*) are certain various Impressions made upon the Elements, exhibiting them in different Forms, and are called *Meteors* from their Elevation; because for the most part, they appear to be high in the Air; and they are either Fiery, Airy, or Watery.

Fiery Meteors, are such as consist of a fat, sulphurous kindled Smoke, whereof there are several Kinds; as *Ignis Fatuus*, *Trabs*, *Ignis Pyramidalis*, *Draco Volans*, *Capra Saltans*, *Thunder* and *Lightning*, &c.

Airy Meteors, are such as consist of flatuous and spirituous Exhalations, as *Winds*, &c.

Watery Meteors consist of Vapours, or Watery Particles, by the Action of Heat separated from each other, and variously modified, as *Rain, Dew, &c.*

Dr. Woodward, in his *Natural History of the Earth*, p. 208. supposes the Matter of *Meteors* to be in good measure of a mineral Nature; and that the mineral Particles contained in the *Strata* of the Earth, are raised up by the Subterranean Heat or Fire, along with the Vapours ascending from the Abyss, and pervading those *Strata*, and especially at such times as the Sun's Power is so great, as to penetrate the exterior Parts of the Earth, and therefore help to mount them up into the Atmosphere. These Sulphureous, Nitrous, and other light and active mineral Particles do form *Meteors* in the Air, and particularly are the Cause of *Thunder and Lightning, &c.* and other Fiery Compositions there.

METHOD, or *Disposition*, is that Action of the Mind, by which we range various Ideas, Judgments and Ratiocinations upon one and the same Subject, in that Order which is most proper for its Explanation; and a right Method of Enquiry after Truth, or the Prosecution of any Demonstration, will be found to consist also in a regular Train of Arguments and Consequences rightly disposed in their just and natural Order. If you will believe *Des Cartes*, he saith, in his Book *De Methodo*, That he was able to master the greatest Depths in *Geometry*, by only observing constantly these four following Rules in his Studies.

First, Never to admit any thing for Truth, and to treasure it up in the Mind as such, unless we be demonstratively assured, that it is such.

Secondly, To divide the Difficulties of the Problem, or Matter inquired after, into such a proper Number of Parts, as is most convenient for its Resolution.

Thirdly, To observe exact Order and Method in our Thoughts and Inquiries, so as to begin with the plainest and easiest Things first, and then to proceed on gradually to Things more and more difficult.

Fourthly, To be sure not to slip, over-look, or omit any thing, either in the Difficulties to be solved, or in the means of Inquiry.

These are indeed very good Rules, and I question not were very serviceable to him in his *Geometrical Inquiries*; but the Sight of our Country-man *Harriot's Algebra*, did him as much Service as all of them.

In *Mathematical Inquiries*, there are Two general Methods commonly made use of, the *Analytical*, and the *Synthetical*; which see: And to which may be added, the *Zetical* and *Poristical* Methods; which you will find under those Words.

METONICK Year, or *Period*, is the Space of 19 Years; in which time, the *Lunations* return, and happen as they were before; 'tis sometimes called, *The Great Metonick Year*, and is the same with the *Cycle of the Moon*.

METONYMY, or *Transnominatio*, (a Figure or Trope in *Rhetoric*) is the putting of one Name for another, or expressing a Thing by an-

other Name, than which properly belongs to it; as if we should say, *All the World reads Cicero*; *Cæsar ravaged the Gauls*: it would be plain, what we intended, viz. That the *World* reads *Cicero's Works*; *Cæsar's Army ravaged the Gauls*.

METOPA, in Architecture, is the Interval or Space between every Triglyph in the Frize of the *Dorick Order*. The Ancients used to adorn these Parts with Carved Works or Paintings, representing the Heads of Oxen, Vessels, Basons, and divers other Instruments that were used in their Sacrifices.

METRECHYTA, is an Instrument where-with Liquors are injected into the Womb.

MIASMA, is a contagious Infection in the Blood and Spirits, as in the *Plague, &c.*

MICROCOUSTICKS, the same with *Microphones*.

MICROCOSM; The Body of a Man is called the *Little World*, as a kind of Compendium of the Greater.

MICROMETER, is an Instrument made of Brads, being a Movement with a Plate, or Face, divided like a Clock or Watch, with an Index or Hand, which (being turned) moves two sliding Plates of Brads with Hairs, and counts on the Plate the Revolves or Turns of the endless Screw. This Instrument is fitted to a large Telescope, and used in *Astronomy*, to find the Diameters of the Stars, or Planets.

The Description of this Instrument of Mr. Townley, improved by Dr. Hook, you may see more at large in *Philos. Transact.* N. 29. and the Uses in N. 25. See Vol. II.

MICROPHONES, are Instruments contrived to magnifie small Sounds, as *Microscopes* do small Objects.

MICROSCOPE, is an Optical Instrument, which by extremely magnifying (as they say) any Object, helps us to discover the minute Particles of which Bodies are composed, and the curious Frame and Contexture of them.

To make very small single Eye-glasses for Microscopes.

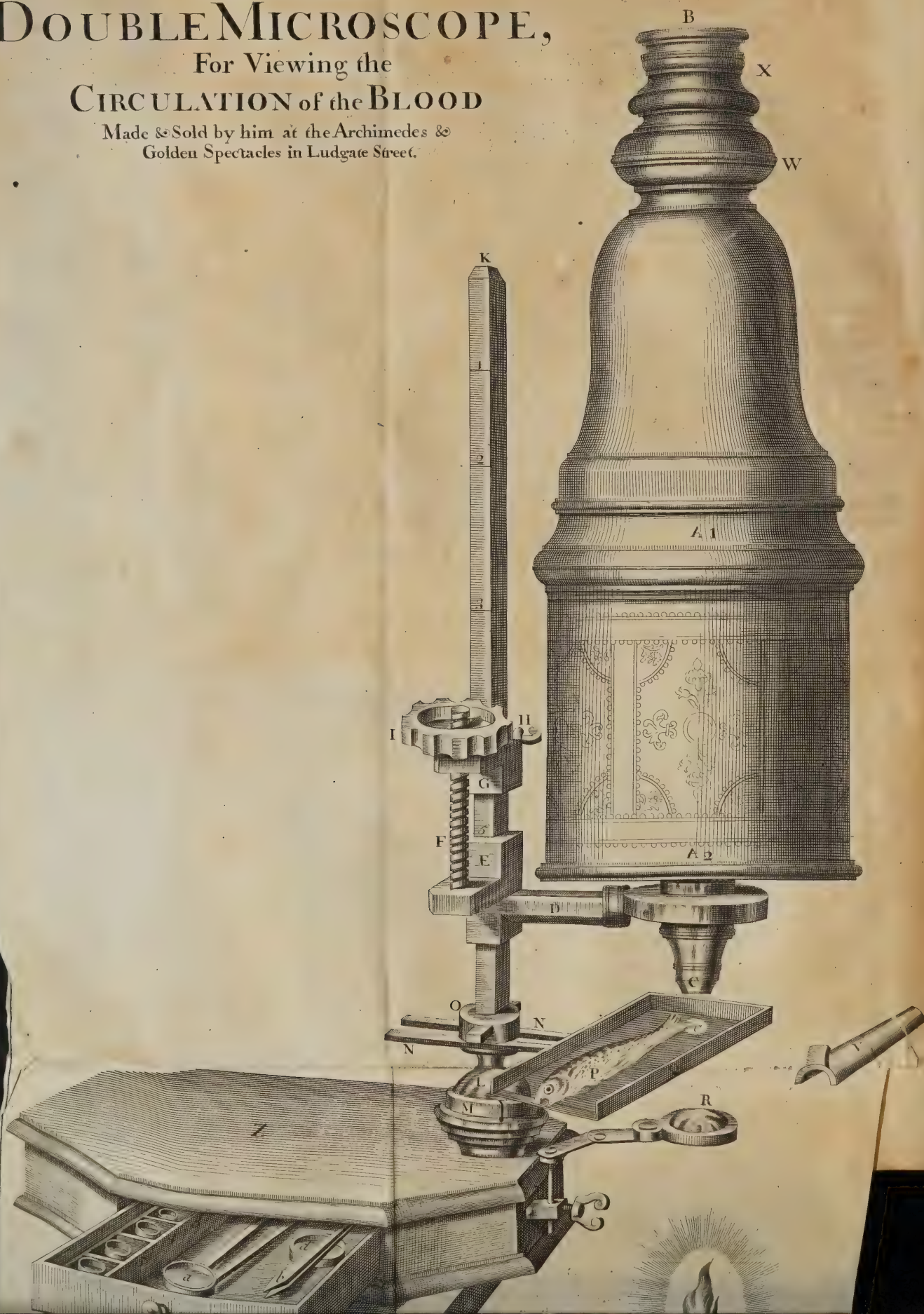
Get some very small Silver-wire, and double it up and down like a Skein of Thread, in order to make a Wick (for a Lamp) of a moderate size; then fill a Lamp with *Spirit of Wine*, well dephlegmated, and use the Silver-wire instead of a Cotton-wick: Then having ready some fine Glafs beaten, powdered, and sifted very small, and well washed and dried, take some of it on the Point of a Silver Needle filed very small, and wetted a little with Spittle, and holding it in the Flame of the Lamp, turn it about 'till it melt, (as it will soon do) into a fine round Globule: You must hold it in the Flame no longer than 'till it come to its round Figure, lest you burn it: The only Difficulty is in giving it that Roundness exactly, but Practice will soon learn you the Knack of it; they must be cleaned afterwards by rubbing them a while on soft Leather. *Philos. Transact.* N. 141.

Those *Microscopes* that are made with single Convex Glasses, must have the Object placed in one Focus of the Glafs (or rather a little nearer), and the Eye must be in the other Focus on the other side.

These

JOHN MARSHALL'S New Invented DOUBLE MICROSCOPE, For Viewing the CIRCULATION of the BLOOD

Made & Sold by him at the Archimedes &
Golden Spectacles in Ludgate Street.



These kind of *Microscopes*, when the Glasses are well made, do magnifie exceedingly: Such are our very Famous Mr. *Mellen's* Glasses, which, I believe, are the best of any in the World of this kind: And such are those of Mr. *Lewenboeck of Delft* in *Holland*, by which so many great Discoveries have been made.

But there is more than one great Inconvenience in these Glasses, *viz.* To magnifie much, the Object must be so near, that it must almost touch the Glass; 'tis also very difficult to fit the Object true to the Glass, and when fitted, to fix it so; and but a very small Part of the Object can be seen at a time. But then they being contrived to carry in the Pocket, are very ready, and will be of vast Use on many Occasions.

The best Glasses of this kind that ever I saw, are made by the above-mentioned Mr. *Mellen*, who formerly lived in *Abchurch-Lane*.

In *Philos. Transact.* N. 42. is an Account of a *Microscope* of *Eustach. Divini* (which is also treated of by *Faber* in his *Opticks*, (*Prop. 46.*) and which I have in some measure experimented my self to be a very good Method of disposing the Glasses. He uses, instead of a common double Convex Eye-glass, two Plane Convex ones, which are so placed as to touch one another in the middle of their Convex Surface; by which means the Glass will take in more of any Object, will represent it flat, and not crooked, and will magnifie also (as they call it) very much. This Glass had four several Lengths (made by Draws); at the least Length, which was 16 Inches, it magnified Lines 41 times bigger than they appear to the naked Eye; at the second Length 90 times; at the third Length 111 times; at the fourth Length 143.

As to the Method of making the same Glass magnifie differently, at different Lengths, Mr. *Marshall* hath brought it to bear very well in his small Pocket *Microscopes*; and this I take to be a good Improvement, which he hath added to the Glasses of *Campani*, which are made after that manner, but with only one Degree of magnifying with one and the same Glass.

In *Philos. Transact.* N. 221. there is an Account of several Microscopical Experiments, by one Mr. *Stephen Gray*; where he speaks of making *Microscopes* with a Globule of Water only, put into an Hole made in a small Brafs Plate, which I my self have often tried; and were it not for the trembling Motion of the Fluid, it would do very well.

He saith also, That by applying a small Globule of Pepper-water, &c. to his bare Eye, (*i. e.* by fixing it on the Surface of his Eye) he could in a darkened Room, by Candle-light or Moon-light, or by looking thro' a small Hole in a piece of Paper, discern the *Animalcula* which were in it, exceedingly magnified; and oftentimes, when the Drop of the Fluid was round and well defined, very distinct and plain.

In N. 232. Mr. *Gray* gives a farther Improvement of his *Water Microscope*.

A Description of Mr. Marshall's Double Microscope.

This Microscope consists of Three Glasses;

The Eye-Glass *W.*

The Middle-Glass *A.*

And the Object-Glass *C.*

B. Is the Cover or Lid, to keep out Dust from the Eye-glass *W.*

X. Is the Place for the Eye.

W. A Screw where the Eye-glass lies.

A 1. A Screw where the Middle-Glass lies.

A 2. The Draw.

C. The Object-Glass fix'd in a Brafs Button, to screw on or off, as Occasion serves.

Z. The Frame or Basis on which the *Microscope* stands firm.

T. A small Drawer in the Frame or Basis, with a Ledge or Till in it, having six Partitions to hold so many several Object-Glasses, one magnifying more than another, and fixed in Brafs Cells ready to screw on at *C*, and marked 1, 2, 3, 4, 5, 6. These Partitions are also marked

1, 2, 3, 4, 5, 6. The other part of the Drawer serves to hold the Object-plate (*a*); a Pair of small Nippers (*b*), to take up or handle any Object conveniently; another Object-plate (*d*), having one side White, and the other Black, to fix your Objects upon, as Black upon White, and White Objects on Black.

L. M. A Brafs Ball and Socket, on which the whole Body of the *Microscope* is moveable, so as to lie in any Position for the Light.

K. O. A square Brafs Pillar on which the *Microscope* is moveable up and down, by means of the Collar *E*, into which the Arm *D* (holding the *Microscope*) is continued.

G. Another Brafs Collar sliding up and down on the Pillar *K. O.* having a small Screw *H*, by which it is, as Occasion serves, fix'd fast to the said Pillar, at any Height.

I. A large Brafs Nut, in whose Centre is a Female Screw, fitted to the Male Screw *F*, which is fix'd in the Collar *E*: By the turning of which Nut *I*, (the Collar *G* being first fix'd to the Pillar by the Screw *H*) the *Microscope* is rais'd up or down on the Pillar, and made to come nearer, or go farther from the Object: And which is also a very great Advantage, the Axis of the *Microscope* is always kept perpendicular to that Point of the Object, over which it was first placed; so that here is not the Inconvenience which occurs in other Glasses, of often losing the Sight of the Object, by screwing the Glass higher or lower.

Q. A Glass Object-Plate fix'd in a Brafs Frame; whose Arm *N. N.* is fix'd to the Pillar by means of the Nut *O*. The Arm *N. N.* hath in it a Slit, by which 'tis easily put on, or taken off the Pillar, and by which it may be fix'd upon it at any Distance.

P. A small Fish lying on the Glass-Plate, that the Circulation of the Blood may be seen in part of the Tail-fin, at (*c*).

R. A Convex-Glass, by whose Help a bright Spot of Light is brought from a Candle at *S*, standing on the Ground while the *Microscope* stands on the Edge of a Table or Stool; which Spot of Light (*c*) serves to render the Circulation more conspicuous.

V. A Lead Coffin to be put on the Fish, to hinder it from springing away, and moving his Tail out of the Light.

1, 2, 3, 4, 5, 6, Are Marks on the Pillar *K. O.* which shew you the Distance that the Object-Glass must be from the Object you look upon,

according

according as the Object Glasses you make use of, magnifie more or less. Thus, for Instance, If you use the Object-Glass, 5 or 6, (either of which will shew the Circulation of the Blood) you must fix the upper Edge of the Collar E, at the Mark 5 or 6 on the Pillar. And then will the Microscope be very near its exact Distance from the Object; so that by a small Turn or two of the Nut I, either way, you may soon exactly fit it to your own Eye, and place the Object in its true distinct Basis.

By this Microscope, Liquors also may be very commodiously examined; for if you place a small Drop of any Liquor on the Glass-plate just in the middle of the Spot of Light (c), the Parts of it will become very visible, and its *Athimacula*, if it have any, will be discovered. And thus may the Eels in Vinegar, the small Creatures in Black Pepper-water, or in Waters where Wheat, Barley, &c. have been infused, the Eels and other small living Creatures in Puddle-water, be as plainly seen as by almost any other Microscope.

And one Thing I ought not to omit to speak on this Occasion; which is, That I have often with this Glass, seen the Circulation of the Blood in the Fins of the Tail of Tadpoles; and indeed more conspicuously here than in any other Creature: For the Fins grow all round the Tail, and coming but a little way out beyond the Body of it, both the Ejaculation of the Blood out by the Arteries, and its Return again by the Veins, is much quicker than in the Tails of Fishes; and abundance more Streams, Turns and Windings of the moving Blood are here visible, than I could ever see in any other Animal. To which I may add, That the Creature will live a good while out of the Water, and will lie very still.

The Object and the Image in the distinct Base being reciprocal (as Mr. *Molineux* shews, p. 102. of his *Dioptricks*), the Image there may be formed larger than the Object, on which depends the Doctrine of the *Double Microscope*.

Which Instrument I believe, was first contrived, at least fitted for Use and Observation by Dr. *Hook*, F. R. S. and a Description of it is published in his *Micrographia*.

Since that, Mr. *John Maskeal*, at the *Archimedes* in *Ludgate-street*, hath brought it to a very good Degree of Perfection: And I take his *Double Microscope* here described, in all Respects, to be the most useful, handy, and ready Instrument of this kind.

I have had *Mellen's* Glasses, and seen *Lewenhoeck's* and *Campani's*, but I would sooner have the *Double Microscope* than any of them, and the Price is much easier.

MILIARIS Herpes. See *Herpes*.

MILKY-WAY, or *Via Lactea*, the *Galaxy*, is a broad white Path or Track, encompassing the whole Heavens, and extending it self in some Places with a double Path, but for the most Part with a single one. Some of the Antients, as *Aristotle*, &c. imagin'd that this Path consisted only of a certain Exhalation hanging in the Air; but by the Telecopical Observations of this Age, it hath been discovered to consist of an innumerable Quantity of Fixed Stars, different in Situation and Magnitude; from the confused Mixture of whole

Light, its white Colour is supposed to be occasioned. It passes through the Constellations of *Cassiopeia*, *Cygnus*, *Aquila*, *Perseus*, *Andromeda*, Part of *Ophiucus*, and *Gemini*, in the Northern Hemisphere; and in the Southern, it takes in Part of *Scorpio*, *Sagittarius*, *Centaurus*, the *Argo Navis*, and the *Ara*.

Metrodorus, and some *Pythagoreans*, thought the Sun had once gone in this Track, instead of the Ecliptick; and consequently, that its Whiteness proceeds from the Remains of his Light. As the *Galaxy* is composed of an Infinity of small Stars, so it hath usually been the Region in which new Stars have appeared: As the new Star in *Cassiopeia*, which was first seen A. D. 1572. that in the Breast of the *swan*, and another in the Knee of *Serpentarius*; and several others, which have appeared for a while, and then become invisible again.

MILITARY Architecture, the same with *Fortification*.

MILITARY Execution, is delivering a Country up to be ravaged and destroyed by the Soldiers, when it refuses to pay Contribution, &c.

MIMOSÆ Plantæ, the same with *Sensitive*; which see.

MINE, in Fortification, is a Hole dug or made by a Pioneer under the Rampart, or under the Face of the Bastion, whereto there are several oblique and winding Passages: When it is finished, divers Barrels of Powder are placed therein, together with a Train or *Saucidge*; and the Quantity of Powder is proportioned to the Height and Weight of the Body which is to be blown up. There are also *Mines* sprung in the Field, which are called *Fougades*.

The Ally or Passage of a *Mine* is usually about four Foot square; at the end of which is the *Chamber of the Mine*, as they call it. The farther it is carried on, the more it is subject to be discovered by the Enemy; therefore 'tis best not to aim at Mining too far, and to make a new one where the former takes no Effect.

MINE-DIAL, is a Box and Needle, with a Brafs Ring divided into 360 Degrees, with several *Dyals* graduated thereon; generally thus made for the Use of Miners.

MINERALS, are hard Bodies dug out of the Earth or Mines (whence the Name) being in part of a Metalline, and in part of a Stony Substance, and sometimes with some Salt and Sulphur intermixed with the other. Of these see a large Account under the more general Word *Fossils*. See also *Stones* and *Minerals*.

MINIM, a Term in Musick; see *Notes* and *Time*.

MINIMA Naturalia, are such Particles of Matter, which tho' they have each a determinate Shape and Bulk, yet are too minute to be singly sensible. These are supposed to be intire, and undivided, and to be perfectly solid; and are the same with what in another Word are called *Atoms*, because of their supposed Indivisibility.

MINIMENTS, or rather *Muniments*, in Law, are the Evidences or Writings, whereby a Man is enabled to defend the Title of his Estate. And some say this Word *Miniments* includes all manner of Evidences.

MINION, a sort of Cannon, is either *Large* or *Ordinary*.

The

The *Large Minion*, or one of the longest Size, has its Bore $3\frac{1}{4}$ Inch Diameter, and is 1000 Pound weight: its Load is $3\frac{1}{2}$ Pound of Powder; its Shot 3 Inches Diameter, and $3\frac{1}{2}$ Pound weight; its Length is 8 Foot, and its level Range 125 Paces.

The *Ordinary Minion*, its Bore is 3 Inches in Diameter, and weighs about 800 or 750 Pound weight: It's 7 Foot long; its Load 2 Pound and a half of Powder; its Shot near 3 Inches Diameter, and weighs 3 Pounds 4 Ounces; and it shoots point-black 120 Paces.

MINIUM, or *Red-lead*, is the common Calx of Lead calcined for 3 or 4 Hours in a Reverberatory Furnace, till it turn to a Red Colour.

MINOR, a Term in Law, signifying one in Nonage, Minority, or under Age: But more properly an Heir Male or Female, before they come to the Age of One and twenty: during which Minority their Actions are invalid, &c. Yet a *Minor* may present, as Patron to an Ecclesiastical Benefice.

MINUTE, is the 60th Part of a *Degree* or *Hour*; so that every Hour, or Degree of any great Circle, is divided into 60 Minutes, every Minute into 60 Seconds, each Second into 60 Thirds, &c.

MISADVENTURE, or *Misaventure*, in Law, has a special Signification, for the killing of a Man, partly by Negligence, and partly by Chance. As if a Man, thinking no Harm, carelessly throws a Stone, or shooteth an Arrow, &c. wherewith he killeth another: In this Case he commits not Felony, but only loseth his Goods, and hath Pardon of Courfe for his Life. Some between *Aventure* and *Misaventure* make this Distinction, That *Aventure* is meer Chance: As if a Man, being upon or near the Water, be taken with some sudden Sicknes, and so falls in, and is drown'd; or into the Fire, and be burn'd to Death. *Misaventure*, they say, is where a Man cometh to his Death by some untoward Violence; as the Fall of a Tree, the Running of a Cart-wheel, the Stroke of a Horse, or the like.

MISE, in Law, hath several Significations: As first, a Gift or Customary Present which the People of *Wales* give to every new King or Prince at their Entrance into that Principality. Sometimes *Mises* are taken for Taxes or Tollages, Anno 25. E. 1. 5. Sometimes for Costs and Expences; as *pro Misis & Custagiis*, for Costs and Charges ordinarily used in the Entries of Judgment in Personal Actions.

Mise is also a Term of Art, appropriated to a *Writ of Right*; so called, because both Parties have put themselves upon the meer Right, to be tried by the *Grand Assise*, or by *Battel*. So that which in all other Actions is called an *Issue*, in a *Writ of Right* is called a *Mise*; unless a Collateral Point be tried, and there it is called an *Issue*. To join the *Mise* upon the *Meer*, signifies; to join the *Mise* upon the *Clear Right*; which is to join upon this Point, Whether hath more Right, the Tenant or Demandant?

MISERERE Mei, or *Chordaplus*, is a most vehement Pain in the Guts, proceeding from an Inflammation of them, or Involution, and the Peristaltick Motion inverted; whence the Excrements are discharged by the Mouth. It is called also *Volvulus*.

MISERICORDIA in Law, is used for an Arbitrary Amerciament imposed on any for an Of-

fence; for where the Plaintiff or Defendant in any Action is amerced, the Entry is *Ideo in Misericordia*. It is called *Misericordia*, because it ought to be very moderate, and rather less than the Offence. Therefore if a Man be unreasonably amerced in a Court, not of Record, as in the *Court-Baron*, &c. there is a *Writ* called *Moderata Misericordia*, directed to the Lord or his Bailiff, commanding them that they take moderate Amerciaments. Sometimes *Misericordia* is to be quit and discharged of all manner of Amerciaments, that a Man may fall into in the Forest.

MISPRISION, a Term in Law, signifying Neglect or Oversight. As for Example:

Misprison of Treason or *Felony*, is a Neglect or Light account shewed of *Treason* or *Felony* committed, by not revealing it when we know it to be committed; or by letting any Person committed for *Treason* or *Felony*, or Suspicion of either, to go, before he be Indicted. *Misprison of Treason*, is the Concealment, or not disclosing of known *Treason*: For which, the Offenders are to suffer Imprisonment during the King's Pleasure; lose their Goods, and the Profits of their Lands, during their Lives. *Misprison of Felony*, is only Finable by the Justices before whom the Party is attained: But Justices of the *Common-Pleas* have Power to assess Fines and Amerciaments upon Persons offending by *Misprisions*, Contempts, or Neglects, for not doing, or misdoing any thing in or concerning Fines. *Misprison of Clerks*, is a Neglect of Clerks in writing, or keeping Records. By the *Misprison of Clerks*, no Procefs shall be annulled or discontinued: And Justices of Assize shall amend the Defaults of Clerks *misprising* of a Syllable, or Letter, in writing.

MISSEN-Mast of a Ship is a round and long piece of Timber, standing in her Stern or sternmost Part. Some great Ships require two; then the next the Main-mast, is the *Main-missen*; and that next the Poop, the *Bonaventure-missen*. But when at Sea, they use the Word *Missen* alone, they always mean the Sail, and not the Mast. And to the Sail these several Terms of Art following belong: *Set the Missen*; i. e. Set the *Missen-sail* right, as the ought to stand. *Change the Missen*; i. e. Bring the *Missen-yard* over to the other side of the Mast. *Peek the Missen*; i. e. Put the *Missen-yard* right up and down the Mast. *Spell the Missen*, i. e. Let go the Sheer; and withal, *Peek up the Yard*. The Use of this *Missen* is to keep a Ship close to a Wind: Wherefore, if a Ship be apt to *Gripe* too much (as they call it) they use no *Missen*. A *Missen* is made use of often when a Ship rides at Anchor, to back her a-Stern, so that she may not foul her Anchor on the turning of the Tide. Sometimes also they *Lie a-Try* with their *Missen* only. The Length of the *Missen* is the same with the Height of the Main-top-mast from the Quarter-deck, and the *Missen-top-mast* half that.

MISSES. See *Mise*.

MITTELLA, is the Surgeons Term for the Swath that holds up the Arm when it is hurt or wounded.

MITTENDO *manuscriptum pedis finis*, is a *Writ* Judicial, directed to the Treasurer and Chamberlain of the *Exchequer*, to search and transmit the Foot of a Fine, acknowledged before Justices in *Eyre*, into the *Common-Pleas*, &c.

MITTIMUS, is a *Writ* by which Records are transferred from one Court to another, sometimes immediately:

immediately : As, out of the *King's-Bench* into the *Exchequer* ; and sometimes by a *Certiorari*, into the *Chancery* ; and from thence, by a *Mittimus*, into another Court. This Word is also used for the Precept that is directed by a Justice of Peace to a Gaoler, for the receiving and safe-keeping a Felon, or other Offender, by him committed to the Gaol.

MITRALES, are two Valves at the Orifice of the *Vena pulmonaris*, in the Left Ventricle of the Heart ; and are so called, because, when they are joined together, they something resemble a Mitre : They are broader than the other Valves ; they are situated so as to look inwards, and do very little differ in Bigness and Form from the *Tricuspid* in the right Ventricle. Their Use is to hinder the Reflux of the Blood brought into the Left Ventricle of the Heart by the *Vena pulmonaris*, back towards the Lungs again.

MIVA, in Pharmacy, is the Fleesh or Pulp of a Quince boiled up with Sugar into a thick Consistence.

MIXT, *i. e.* a *Mixt Body* : By which in Chymistry and Natural Philosophy, is understood a Body not mixt or compounded by Art, but by Nature ; such as Minerals, Vegetables and Animals, from whom by Chymistry different Substances can be separated.

MIXT Figures in Geometry. See *Figuræ*.

MIXT Number, is one that is part Integer or whole Number, and part Fraction ; as, $4\frac{1}{2}$, $10\frac{1}{3}$, &c.

MIXT Reason or Proportion, is when the Sum of the Antecedent and Consequent is compared with the Difference between Antecedent and Consequent : As, if $\frac{3}{a} : \frac{4}{b} :: \frac{12}{c} : \frac{16}{d}$ Then

$$\frac{7}{a+b} : \frac{1}{a} :: \frac{28}{c+d} : \frac{4}{c+d}$$

MOAT, in Fortification, is a hollow Space or Ditch dug round a Town or Fortrefs which is to be defended ; whereof the Length and Breadth often depends upon the Nature of the Soil, according as it is Marshy or Rocky. But *Moats* in general may be from 16 to 22 Fathom broad, and from 15 to 25 Foot deep.

Dry Moat, is that which is destitute of Water, and ought to be deeper than one that is full of Water.

Lined Moat, is that whose Scarp and Counter-scarp are cas'd with a Wall of Masons-Work lying in *Talus* or a-slope.

Flat-bottom'd Moat, is that which hath no sloaping, its Corners being somewhat rounded. All Moats must be well flanked, and in general so wide, as that no Ladder, Tree, &c. can reach across it. If the Ditch be dry, or has but little Water, there is usually another small Trench cut quite along the middle of it.

MODEL in Architecture. See *Module*.

MODERATA Misericordia, is a Writ for him that is amerced in a Court Baron, or other being not of Record, for any Transgression or Offence beyond the Quality of a Fault. It is directed to the Lord of the Court, or his Bayliff, commanding them to take a moderate Amercement of the Party, and is founded upon *Magna Charta*, cap. 14. *Quod nullus liber homo amercietur nisi secundum qualitatem delicti*, &c.

MODES in Musick. See *Mood*.

MODILLONS, or *Modillions*, in Architecture,

are little Brackets which are often set under the Cornices, more-especially in the *Corinthian* and *Composite* Order, and serve to support the Projection of the *Larmier* or *Drip*. The Word comes from the Italian *Modiglione*, signifying a little Model or Measure ; but this Part must be distinguished from the great Model, which is the Diameter of the Pillar : For as the Proportion of an Edifice in general depends on the Diameter of the Pillar, so the Size and Number of the *Modillions*, as also the Interval between them ought to have due Relation to the whole Fabrick.

MODIOLUS, *Trepanum*, or *Anabaptisum*, is an Instrument which they use in profound Corruptions, Contusions, Cuts, and Fractures of the Bones of the Head, not to be applied ; unless, 1. The Chips and Prominences of the Bones prick. 2. When the Upper Table is entire, but depressed ; and the Lower broken. 3. When the extravasated Blood would choke a Man with Corruption. The manner of *Trepanning*, or opening the Skull, is thus : When the Hairs are shaven off, the Skin is to be cut to the *Pericranium*, avoiding, as carefully as may be, the Muscles of the Temples, and the Sutures of the Skull ; and for this time the Wound is to be bound up, unless there be so little Blood spilt, that the Membrane, called *Pericranium*, may at the same time be pulled off from the Skull. Then after a few Hours you may stop the Ears of the Patient, take one of these Instruments, called a *Masculine Modiolus*, whose Point is to be fixed in the Skull, but so far off the Fracture, that it touch it not, much less the Suture, with its Teeth ; tho' some Surgeons never avoid the Sutures, and assure us that they have perforated them as successfully as any other Part : Then hold the Instrument fast with the Left Hand, and turn it round with the Right, till you have cut a pretty deep Hole : After this take a *Feminine Modiolus*, (which has no Point in the middle) and turn it round, as before. In the mean time take away the Dust or Chips that proceed from the Perforation, and moisten the Instrument in Oil and Water, to make it cool and slippery. The Blood that appears, will shew that you are now gone as deep as the second Table, *i. e.* beyond the Skull, to the *Meninges* ; and then you must press very gently, lest the Membrane of the Brain be unadvisedly hurt. When the Bone begins to wag, put something in betwixt the sides of the Wound ; loosen it, and rake it out with a pair of Surgeon's Pincers. *Blanchard*.

MODO & Forma, are Words of Art in Prols and Pleadings ; and namely, in the Answer of the Defendant ; whereby he denieth himself to have done the Thing laid to his Charge, *Modo & forma declarata* : It signifies as much as that Clause in the Civil Law, *negat allegata prout allegantur, esse vera* ; where *modo & forma* are of the Substance of the Issue, and were but Words of course.

MODULE, or *Model*, in Architecture, is a certain Measure invented by *Vignola*, and made use of to regulate the Proportion of the whole Building. It is generally half the Diameter of a Pillar at the lower end, in the *Tuscan* and in the *Doric* Order ; but in others, the whole Diameter. This Diameter is divided into 12 equal Parts ; and into 18 for the *Ionick*, *Corinthian*, and *Composite* Orders. And this *Module* or *Model* is a kind of Universal Measure, which helps us

to get rid of the great Uncertainties there are in the Feet and Inches of divers Nations, and at divers Times.

MODUS Decimendi, is when either Land, a Sum of Money, or Yearly Pension, is given to the Parson, &c. by Composition, as Satisfaction for his Tythes in kind.

MOINEAU, is a Name the French, and some Modern Writers of Fortification, give to a little *Plat-Bastion*, which is raised before a Curtain that is too long, and which hath two other Bastions at the ends of it; for they being out of Musket-shot one of the other, must be defended by some such thing as this *Moineau* or *Plat-Bastion*. Sometimes the *Moineau* joins to the Curtain, and sometimes is disjoined from it by a Moat.

MOLA Genu, Patella, or Rotula, is a round and broad Bone, placed at the jointing of the Thigh and Leg, to preserve the Knee from slipping out, and to defend the Juncture from External Injuries.

MOLA Carneæ, is a Fleishy and sometimes a Spongy Substance, without Bones or Bowels: It is often black, like concreted Blood; and sometimes extream hard; preternaturally brought into the World instead of a *Fœtus*.

MOLARES, or Maxillares Dentes. See *Dentes*.

MOLINE. The Heralds Term for one of their Croffes of this Figure. The *Field Azure*, a *Crofs Moline*, or, by the Name of *Molineux*. *Guillim* saith this Crofs representeth a Mill-Rind, or the Form of the Ink of a Mill.



MOLOSSUS, is the Foot of a Latin Verse, consisting of Three Syllables, when they are all long.

MOMENTS, are sometimes taken for the least and most insensible Parts of Time; as when we say, such a thing was done in a Moment.

In Mathematics, *Moments* are such indeterminate and instable Parts of Quantity, as are supposed to be in perpetual Flux, i. e. either continually decreasing or increasing; which latter are taken for Affirmative and Positive Moments, and the former for Negative or Subtractive ones; And these continually increasing or decreasing Particles are supposed to be infinitely small; for as soon as ever they come to be of any finite Magnitude, they cease to be *Moments*. *Moments* therefore are to be look'd upon as the generative Principles of finite Magnitudes; and are here supposed to have no Magnitude, but to be *Inceptive* only of it, to use Dr. Wallis his Word.

And because 'tis the same thing, if in the room of these Moments, the Velocities of their Increases or Decreases be made use of, or the finite Quantities proportionable to such Velocities; this Method of proceeding, which considers the Motions, Changings, or Fluxions of Quantities, hath come to be called *Fluxions*.

Moments also in a Physical Sense, as they are used in reference to the Laws of Motion, signifie the *Quantities of Motion* in any moving Bodies; and sometimes, simply, the Motion it self; and they define it to be the *Vis insita*, or Power by which any moving Bodies do continually change their Places,

And in comparing the Motions of Bodies, the *Ratio* of these Moments is always compounded of the Quantity of Matter in, and the Celerity of the moving Body: So that the *Moment* of any moving Body may be considered as a *Rectangle* under the *Quantity of Matter* into the *Celerity*. And since 'tis certain that all equal Rectangles have their Sides reciprocally proportionable, (14. *2. 6. Eucl.*) therefore if the *Moments* of any Moveables are equal, the Quantity of Matter in one, to that of the other, will be reciprocally: as the Celerity of the Latter to the Celerity of the Former: And *vice versa*, if the Quantities of Matter are reciprocally proportionable to the Celerities, the *Moments* or Quantities of Motion in each will be equal:

The *Moment* of any moving Body may be considered also as the Aggregate or Sum of all the Moments of the Parts of that Body; and therefore where the Magnitudes and Number of any Particles are the same, and where they are moved with the same Celerity, there will be the same *Moments* of the Wholes.

MONADES. See *Digits*.

MONKS-Seam. So the Sailors call sewing the Edges or Selvages of the Sails together, one over another; and 'tis sew'd on both sides, to make it the stronger.

MONOCHORD, a kind of Instrument anciently of singular Use for the Regulating of Sounds; but some appropriate the Name of *Monochord* to an Instrument that hath only one single String, as the *Trumpet Marine*.

The Ancients made use of the *Monochord* to determine the Proportion of Sounds to one another: When the *Chord* was divided into two equal Parts, so that the Terms were as 1 and 1, they called them *Unisons*; but if they were as 2 to 1, they called them *Octaves* or *Diapasons*; when they were as 3 to 2, they called them *Fifths*, or *Diapentes*; if they were as 4 to 3, they called them *Fourths*, or *Diatesserons*; if the Terms were as 5 to 4, they call it *Diton*, or a *Tierce major*; but if the Terms were as 6 to 5, then they called it a *Demi-diton*, or a *Tierce minor*; and lastly, if the Terms were as 24 to 25, they called it a *Demiton* or *Dieze*.

The *Monochord* being thus divided, was properly that which they called a *System*, of which there were many kinds, according to the different Divisions of the *Monochord*.

MONOCOLUM, is the Gut *Cæcum*.

MONOPETALOUS Flowers, (in Botany) are such, as, tho' they may be seemingly cut into four or five small *Petala* or Leaves, are yet all of one piece, and which falling off all together, have their Flower in one piece. See *Petala*.

MONOPOLY, in Law, is a Grant to any Person or Persons, of or for the sole buying, selling, making, working, or using any Commodity.

MONOTRIGLYPH, a Term in Architecture, signifying the Space of one *Triglyph* between two *Pilasters*, or two *Columns*.

MONSTRANS De droit, in a Legal Sense, signifies a Suit in *Chancery*, for the Subject to be restored to Lands and Tenements, which he shews to be his Right, tho' by Office found to be in the Possession of another lately dead; by which Office the King is entituled to a *Chatrel*, Free-hold, or Inheritance in the said Lands.

MONSTRANS *De faits ou Records, shewing of Deeds or Records*, is thus : Upon an Action of Debt brought upon an Obligation, after the Plaintiff hath declared, he ought to shew his Obligation ; and so it is of *Records*. And the Difference between *Monstrans de faits* and *Oyer de faits*, is this : He that pleads the *Deed or Records*, or declares upon it, ought to shew the same ; and the other, against whom such *Deed or Record* is pleaded, may demand *Oyer* of the same.

MONSTRAVERUNT, is a Writ that lies for the Tenants in *Ancient Demesne*, being distrained for the Payment of any Toll or Imposition, contrary to their Liberty which they do or should enjoy.

MONT *Pagnotte*, or the *Post of the Invulnerable*, is an Eminence chosen out of Cannon-shot of a Place besieged ; where curious and wary Persons place themselves to see the Attack and the manner of the Siege.

MONTH, properly speaking, is the Time in which the Moon runs through the Zodiack, and therefore is accounted by the Motion of the Moon ; and therefore the Lunar Month is either *Periodical*, which is the Time of the Moon's Motion from any one Point of the Zodiack to the same again, and is something less than 27 Days and 8 Hours ; or else *Synodical*, which is the Time between New Moon and New Moon, and is something more than 29 Days and an half.

There is also a *Solar Month*, which is the Time that the Sun takes up in running through one of the Signs of the Zodiack, and is almost 30 Days and half.

And both these *Solar* and *Lunar Months* are either *Astronomical*, like those above-mentioned ; or *Civil*, which are various, according to the Usage of accounting in different Places, Cities and Nations.

The *Egyptians* accounted by *Solar Months*, each of 30 Days ; and to compleat their Year, after 12 such Months, they added 5 Days, which the odd Hours made up.

But most of the Ancient Nations accounted by the *Lunar Synodical Month* ; as the *Jews*, *Greeks*, and the *Romans*, till *J. Cesar's* Time ; and as the *Mahometans* do to this Day. And because these Months did not contain an exact Number of Days, to adapt them to *Civil* Computation, they accounted alternately one Month to have 30, and the next 31 Days ; and by this means they made two such *Civil Months* to be equal to two *Lunar* ones of 29 Days and half ; and they brought it to pass, that the New Month, for a Run of many Years, did not much deviate from the First Day of the *Civil Month*.

MOODS in *Grammar*, determine the Signification of *Verbs*, as to the Manner and Circumstances of the Affirmation ; and are in Number Six, viz. The *Indicative*, the *Imperative*, the *Optative*, the *Subjunctive*, and the *Infinitive Mood* ; which see.

MOOD in *Musick*, signifies certain Proportions of the Time, or Measure of Notes. These *Moods* or *Modes* of measuring Notes, were formerly Four in Number, viz.

1. *The Perfect of the More*, in which a *Large* contain'd three *Longs*, a *Long* three *Breves*, a *Breve* three *Semi-breves*, and a *Semi-breve* three *Minims*.

2. *The Perfect of the Less*, wherein a *Large* comprehended two *Longs*, a *Long* two *Breves*, a *Breve* three *Semi-breves*, and a *Semi-breve* two *Minims*.

3. *The Imperfect of the More*, in which a *Large* contained two *Longs*, a *Long* two *Breves*, a *Breve* two *Semi-breves*, and a *Semi-breve* three *Minims*.

4. *The Imperfect of the Less*, is the same with that which we call the *Common Mood*, the other three being now altogether out of Use ; altho' the Measure of our *Common Triple-time* is the same with the *Mood Imperfect of the More*, except that we reckon but two *Minims* to a *Semi-breve*, which in that *Mood* comprehend three.

In our *Common Mood*, two *Longs* make one *Large*, two *Breves* a *Long*, two *Semi-breves* a *Breve*, &c. proceeding in the same Order to the last or shortest Note : So that a *Large* contains two *Longs*, four *Breves*, eight *Semi-breves*, sixteen *Minims*, thirty two *Crotchets*, sixty four *Quavers*, &c.

Besides these *Moods of Time*, Five others relating to Tune, were in Use among the Ancient *Grecians*, which were termed *Tones* or *Tunes* by the *Latins* ; the Design of either being to shew in what Key a Song was set, and how the different Keys had relation one to another.

These sorts of *Moods* were distinguish'd by the Names of the several Provinces of *Greece*, where they were first invented ; as the *Doric*, *Lydian*, *Ionick*, *Phrygian*, and *Eolick*.

Doric Mood consisted of slow-tun'd Notes, and was proper for the exciting Persons to Sobriety and Piety.

Lydian Mood was likewise used in Solemn Grave Musick ; and the Descant or Composition was of slow Time, adapted to Sacred Hymns or Anthems.

Ionick Mood was for more light and soft Musick ; such as pleasant amorous Songs, *Sarabands*, *Corants*, *Jiggs*, &c.

Phrygian Mood was a Warlike kind of Musick, fit for Trumpets, Hautboys, and other Instruments of the like Nature ; whereby the Minds of Men were animated to undertake Military Achievements, or Martial Exercises.

Eolick Mood, being of a more airy, soft, and delightful Sound, such as our *Madrigals*, served to allay the Passions by the means of its grateful Variety and melodious Harmony.

These *Moods* or *Tones* were distinguished into *Authentick* and *Playal*, with respect to the dividing of the *Octave* into its Fifth and Fourth : The Former was when the Fifth Possessed the Lower Place, according to the Harmonical Division of an *Octave* ; and the other was when it stood in the Upper Place, according to the Arithmetical Division of the same *Octave*.

MOON. The Periodical Revolution of the Moon, in reference to the Fixed Stars, is 27 Days, 7 Hours, 43 Minutes : And in the same Space of Time, by a strange Correspondence and Harmony of the two Motions, it revolves the same way about its own Axis ; whereby (one Motion as much converting it to, as the other turns it from the Earth) the same side is always exposed to our Sight. See Vol. II.

The Librations of the Moon's Body, which occasion that the same Hemisphere exactly is not always exposed to our Sight, arise from the Eccentricity of the Moon's Orbit, from the Perturbations by the Sun's Attraction, and from the Obliquity of the Axis of the Diurnal Rotation of the Moon's own Orbit ; without the Knowledge of which Circumstances, her *Phænomena* were inexplicable, but by the Consideration of them are very demonstrable.

The mean Horary Motion of the Moon, in respect of the Fixed Stars, is 32 minutes, 56 seconds, 27 thirds, 12 fourths and an half.

The Moon is distant from the Earth, according to most Astronomers, 59 ; according to *Vindeline*, 60 ; *Copernicus* 60 $\frac{1}{2}$; *Kircher*, 62 $\frac{1}{2}$; and according to *Tycho*, 56 $\frac{1}{2}$ Semi-diameters of the Earth. Sir *Isaac Newton* thinks the Distance ought to be esteemed about 61 : Therefore the mean Distance may be reckoned 60. But if the Earth and Moon move both round the Sun, with their common Centre of Gravity, that admirable Astronomer demonstrates, that the Distance between the Centres of the Earth and Moon, will 'be 60 $\frac{1}{2}$ of the Earth's Semi-diameter, *Prop.* 60. *Lib.* 1. *Princip.*

She is nearer the Earth at her *Syzygy*, than in the Quadrature, by $\frac{1}{2}$ Part of the Distance.

According to *M. Cassini*, the Moon's greatest Distance from the Earth is 61, the mean Distance 56, and the least Distance 52 Semi-diameters of the Earth.

The Power of the Moon's Influence as to the Tides, is to that of the Sun as 6 $\frac{1}{2}$ to one. Sir *Isaac Newton*.

As to the Inequality of the Moon's Motion, (which proceeds from the Action of the Sun, disturbing the Motion of the Secondary Planets) she moves swifter, and describes (by a Radius drawn from it to the Earth) a greater Area in proportion to the Time, hath an Orbit less curved, and by that means comes nearer to the Earth in her *Syzygies* or Conjunctions, than in the Quadratures, unless the Motion of her Eccentricity hinder it : Which Eccentricity is greatest, when the Apogee of the Moon happens in the Conjunctions ; and is least, when the Apogee happens at the Quadratures. And therefore the Moon is swifter as well as nearer to us in her Perigee, and more remote and slower in her Apogee at the Conjunctions, than at the Quadratures ; and her Motion is swifter also in the Earth's Aphelion, than in its Perihelion. The Apogee also goes forward swifter in the Conjunctions, and goes slower at the Quadratures : But her Nodes are at rest in the Conjunctions, and do recede most swiftly in the Quadratures.

The Moon also perpetually changes the Figure of her Orbit, or the Species of the Ellipse she moves in.

There are also some other Inequalities in the Motions of this Planet, which can hardly be redu-

ced to any certain Rule : As, That the Velocities or Horary Motions of the Apogee and Nodes, and their Equations, and the Difference between the greatest Eccentricity in the Conjunctions, and the least in the Quadratures ; and that Inequality which is called the *Variation of the Moon* : All these do increase and decrease annually, in a triplicate Ratio of the apparent Diameter of the Sun : And this *Variation* is increased and diminished in a duplicate Ratio of the Time between the Quadratures ; as Sir *Isaac Newton* proves in many places of his *Principia*.

That Curious Person found the Apogee in the Moon's *Syzygies* to go forward 23 min. each Day, in respect of the Fixed Stars ; and to go backward 16 min. $\frac{1}{2}$ each Day in the Quadratures : And therefore the middle Annual Motions he estimates at 40 deg.

This differs something from Mr. *Flamsteed's* Astronomical Tables ; where the Diurnal Progreſſion of the Moon's Apogee is 24 min. 28 seconds in the *Syzygies*, and the Recession 20 min. 12 seconds in the Quadratures. See the Words *Secondary Planets*.

That the Cause of the *Secondary Light of the Moon*, as they call it ; that is, the obscure Part of her, appearing like kindled Aethers, just before and after the Change or New Moon, is the Sun's Rays reflected from the bright Hemisphere of the Earth to those dark Parts of the Moon, and thence again reflected to the Earth destitute of the Sun's Light ; see proved in *Zucchi's Philosoph. Optic. Nov.* from p. 247, to p. 260. And also in *Tacquet's Opera Geometrica*.

The Excellent Sir *Isaac Newton* makes it a Proposition to inquire into the Figure of the Moon ; and supposing it, at its first Original, to have been a Fluid, like to our Sea, he calculates, that the Attraction of our Earth would raise the Water there to near 90 Foot high, as the Attraction of the Moon raiseth our Water to 12 Foot : Whence the Figure of the Moon must be a *Spheroid*, whose greatest Diameter extended, will pass through the Centre of our Earth ; and will be longer than the other Diameter perpendicular to it, by 180 Feet. And from hence it comes to pass, that we see always the same Face of the Moon : For she cannot rest in any other Position, but will continually endeavour to conform her self to this Situation. *Prop.* 38. *Lib.* 3.

The Moon hath properly no Atmosphere, such as our Earth hath, abounding with Clouds, Winds, Thunder or Lightning ; because her Face always, when our Air is clear, appears distinct and clear ; and by our Telescopes we can see the Sun's Light pass regularly and uniformly from one mountainous Place to another.

Mr. *Flamsteed* in *Philosoph. Transact. N.* 154. saith, That the best Tables of the Moon's Motions do err 12 minutes, or more, in her apparent Place ; which causes a Fault of Half an Hour, or 7 $\frac{1}{2}$ Degrees of the Longitude of Places endeavoured to be found out by her.

M. Azout says, That this Planet's Diameter never appear'd to him above 33 min. and never less than 24 min. 45 seconds.

Sir *Isaac Newton* reckons the mean Diameter of the Moon to be 32 minutes, 12 seconds, as the Sun's is 31 minutes, 27 seconds.

The Density of the Moon he concludes to be to that of the Earth, as 9 to 5 nearly : And that

the Mass or Quantity of Matter in the Moon to that of the Earth, is as 1 to 26 nearly.

The famous Dr. Wallis agrees with Des Cartes in the Solution of that Difficulty, Why the Moon appears to our common Sight so much bigger when near the Horizon, than she doth when near the Meridian; though she be (nearly) one Semi-diameter of the Earth nigher to us in the latter Case, than in the former: Which is, That the Horizontal Moon is capable of being compared with many intervening Objects, interposed Hills, &c. but the Meridional Moon hath nothing to be compared withal; and therefore the Distance between us and her, is judged to be vastly greater, than when she is in the Horizon. He says, It cannot be at all from the Refraction of Vapours near the Horizon, because that can only increase the Altitude of her, but not her Azimuth or Breadth; for the Horizon, in the whole, will always be but a Circle. *Philos. Trans. N. 187.*

The Plane of the Moon's Orbit is inclined to that of the Ecliptick, and makes with it an Angle of about 5 Degrees. *Greg. Astron.* And this Declination varies; and is greatest when the Moon is in the Quadratures; and least when she is in her Syzygies.

By means of the Spots in the Moon (which *Hewellius*, *Grimaldus* and *Ricciolus* gave Names to) the Lunar Eclipses are more accurately observed than formerly, to the great Advancement of *Geography* and *Navigation*, in settling the Longitudes of Places: For the Immersions and Emergences of these Spots from the Shadow of the Earth, are most nicely determined.

Although the Moon's Period round the Earth be in 27 Days, 7 Hours, $\frac{1}{2}$ of an Hour, (which is the Periodical Month) yet because in the Space of a Periodical Month, the Earth also with its Satellite, the Moon, is moved on almost an intire Sign, in *Consequentia*; therefore the Point of the Moon's Orbit, in the last Conjunction, or New Moon, will be gotten too far to the Westward: And therefore the Moon cannot come yet to a new Conjunction with the Sun, but wants of it 2 Days and 5 Hours; which must be past before the intire Lunation will be over, and before the Moon hath exhibited all her *Phases*. These 2 Days and 5 Hours therefore being added to the Periodical Month, make the Synodical one, which consists of 29 Days, 12 Hours, and $\frac{1}{2}$ of an Hour.

Mr. Flamsteed makes the Lunar Periodical Month to be 27 days, 7 hours, 43 minutes, 7 seconds; as, on Enquiry, he assured me.

The other secondary Planets move swifter round their Axes than the Moon; for her (as the Earth's) uniform Revolution round her Axis, is just the Time of her Periodical Month above-mentioned: Which is the Reason that she always obverts the same Face towards us, allowing a little for that Motion of hers which they call her *Libration*. See *Evection* and *Libration*.

The Axis of this Motion is always parallel to its self, and therefore cannot be at Right Angles with the Plane of the Moon's Orbit, (for this, by reason of the Sun's Perturbation of her Motion, is continually changing) but is inclined to it, and is almost at Right Angles with the unchangeable Plane of the Ecliptick.

Tho' the Moon, as well as the Earth, and probably all the Planets, be of a Figure *Oblately Spheroi-*

dical, (that is, having its Diameter at the Equator longer than its Axis) yet the Excels of the Equatorial Diameter in her, is so inconsiderable, that she may well enough pass for a Globe; and perhaps this nearly Spherical Figure of the Moon, may be the Result of her slow Motion round her Axis: For *Jupiter*, which moves the swiftest of any round its Axis, is of a Figure more *Oblate* than any other Planet.

If an Eye were placed in the Moon, it would judge, that the Sun, the Earth, and the other Planets, together with the Fixed Stars, did move from East to West on the Poles of the Ecliptick in a Periodical Month, because in that Space of Time, the Moon turns round her Axis; and these Poles of the Ecliptick would be very remarkable and conspicuous; for the North Pole would be near a Star of the fourth Light, in the third Flexure of *Draco*, which would be but three Degrees distance from the true Pole of the Ecliptick, and the Southern would be distinguished by the four Stars in *Xiphia Piscis*, one of which is nearer that Pole of the Ecliptick, than the Pole-star is to the Arctick Pole: And it would be yet more remarkable by the Nearness of the *Nubecula major*.

The apparent Revolution of the Sun (to a Lunar Spectator) about the Moon seemingly at rest, would seem longer than really it is, because of the Moon's being carried along with the Earth round the Sun in *Consequentia*: So that the Natural Day in the Moon would be an intire Synodical Month; wherefore there the Sun will appear to rise but 12 times, but the Fixed Stars 13. And more exactly, in 19 Years the Sun will rise 235 times, and the Fixed Stars 254: And the rising Sun will always be almost an whole Sign forwarder than he was the Day before.

The Lunar Natural Day would appear to be near equally divided into Light and Darkness, because the Axis of the Moon's Revolution is nearly at Right Angles with the Plane of her Orbit round the Sun; so that she enjoys a perpetual Equinox: And there can be no *Twilight*, because this Planet hath no Atmosphere. In one half of the Moon's Surface (except just near the Edge of the other Hemisphere) the Earth cannot be seen by our Spectator; whereas in the other half it will be always visible, and seem fix'd in the Heavens like a Star.

The Famous Sir ISAAC NEWTON'S Theory of the MOON.

This Theory hath been long expected by all the true Lovers of *Astronomy*, was communicated from Sir Isaac Newton, to Dr. Gregory, *Astron. Professor* at Oxford, and by him published in his *Astron. Elem. Philos. & Geomet.* p. 336. From whence, as it was lately translated into *English*, I thought fit to insert it here.

By this Theory, what by all Astronomers was thought most difficult and almost impossible to be done, the Excellent Sir Isaac Newton hath now effected; viz. To determine the Moon's Place even in her Quadratures, and all other Parts of her Orbit, besides the Syzygies, so accurately by Calculation, that the Difference between that and her true Place in the Heavens, shall scarce be two Minutes, and is usually so small, that it may well enough

enough be reckon'd only as a Defect in the Observation. And this Sir *Is. Newton* experienced by comparing it with very many Places of the Moon, observ'd by Mr. *Flamsteed*, and communicated to him.

The Royal Observatory at *Greenwich*, is to the West of the Meridian of *Paris* 2 deg. 19 min. Of *Urainburgh* 12 deg. 51 min. 30 seconds. And of *Gedani* 18 deg. 48 minutes.

The mean Motions of the Sun and Moon, accounted from the Vernal Equinox at the Meridian of *Greenwich*, I make to be as followeth.

The last Day of *December* 1680, at Noon (*Old Style*) the mean Motion of the Sun was 9 Signs 20 deg. 34 min. 46 seconds. Of the Sun's Apogee, was 3 S. 7 deg. 23. min. 30 sec.

The mean Motion of the Moon at that time, was 6 S. 1 deg. 35 min. 45 seconds. And of her Apogee, 8 S. 4 deg. 28 min. 5 seconds. Of the Ascending Node of the Moon's Orbit, 5 S. 24 deg. 14 min. 35 seconds, &c.

And on the last Day of *December* 1700, at Noon, the mean Motion of the Sun, was 9 S. 20 deg. 43. min. 50 seconds. Of the Sun's Apogee, 3 S. 7 deg. 44 min. 30 seconds. The mean Motion of the Moon was 10 S. 15 deg. 19 min. 50 seconds. Of the Moon's Apogee, 11 S. 8 deg. 18 min. 20 seconds. And of her Ascending Node, 4 S. 27 deg. 24 min. 20 seconds. For in 20 *Julian* Years, or 7305 Days, the Sun's Motion is 20 Revolut. 0 S. 0 deg. 9 min. 4 seconds. And the Motion of the Sun's Apogee, 21 min. 0 seconds.

The Motion of the Moon in the same time, is 247 Revolut. 4 S. 13 deg. 34 min. 5 seconds. And the Motion of the Lunar Apogee, is 2 Revolut. 3 S. 3 deg. 50 min. 15 seconds. And the Motion of her Node, 1 Revolut. 0 S. 26 deg. 50 min. 15 seconds.

All which Motions are accounted from the Vernal Equinox: Wherefore if from them there be subtracted the Recession or Motion of the Equinoctial Point, in *Antecedentia*, during that space, which is 16 min. 0 sec. there will remain the Motions in reference to the Fix'd Stars in 20 *Julian* Years, viz. the Sun's 19 Revolut. 11 S. 29 deg. 52 min. 24 seconds. Of his Apogee, 4 min. 20 seconds. And the Moon's 247 Revolut. 4 S. 13 deg. 17 min. 25 seconds. Of her Apogee, 2 Revolut. 3 S. 3 deg. 33 min. 35 seconds. And of the Node of the Moon, 1 Revolut. 0 S. 27 deg. 6 min. 55 seconds.

According to this Computation the *Tropical Year* is 365 Days, 5 Hours, 48 Minutes, 57 Seconds. And the *Syderal Year* is 365 Days, 6 Hours, 9 Minutes, 14 seconds.

These mean Motions of the Luminaries are affected with various Inequalities: Of which,

1. There are the Annual Equations of the aforesaid mean Motions of the Sun and Moon, and of the Apogee, and Node of the Moon.

The Annual Equation of the mean Motion of the Sun, depends on the Eccentricity of the Earth's Orbit round the Sun, which is $16\frac{1}{2}$ of such Parts, as that the Earth's mean Distance from the Sun shall be 1000: Whence 'tis called the Equation of the Centre; and is when greatest 1 deg. 56 min. 20 seconds.

The greatest Annual Equation of the Moon's mean Motion, is 11 deg. 49 seconds; of her Apogee, 20 min. and of her Node 9 minutes 30 seconds.

And these four Annual Equations are always mutually proportional one to another: Wherefore when any of them is at the greatest, the other three will also be greatest; and when any one lessens, the other three will also be diminished in the same Ratio.

The Annual Equation of the Sun's Centre being given, the three other corresponding Annual Equations will be also given; and therefore a Table of that will serve for all. For if the Annual Equation of the Sun's Centre be taken from thence, for any Time, and be called P, and let $\frac{1}{3}P = Q$, $Q + \frac{1}{3}Q = R$, $\frac{1}{3}P = D$, $D + \frac{1}{3}D = E$, and $D - \frac{1}{3}D = 2F$; then shall the Annual Equation of the Moon's mean Motion for that time be R, that of the Apogee of the Moon will be E, and that of the Node F.

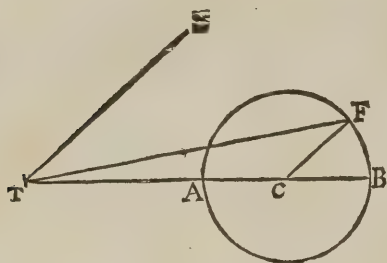
Only observe here, That if the Equation of the Sun's Centre be required to be added; then the Equation of the Moon's mean Motion must be subtracted, that of her Apogee must be added, and that of the Node subtracted. And on the contrary, if the Equation of the Sun's Centre were to be subtracted, the Moon's Equation must be added, the Equation of her Apogee subtracted, and that of her Node added.

There is also an Equation of the Moon's mean Motion, depending on the Situation of her Apogee, in respect of the Sun; which is greatest when the Moon's Apogee is in an Octant with the Sun, and is nothing at all when it is in the Quadratures or Syzygies. This Equation, when greatest, and the Sun in *Perigee*, is 3 min. 56 seconds. But if the Sun be in *Apogee*, it will never be above 3 min. 34 seconds. At other Distances of the Sun from the Earth, this Equation, when greatest, is reciprocally as the Cube of such Distance. But when the Moon's Apogee is any where but in the Octants, this Equation grows less, and is mostly at the same Distance between the Earth and Sun, as the Sine of the double Distance of the Moon's Apogee, from the next Quadrature or Syzygy, to the Radius.

This is to be added to the Moon's Motion, while her Apogee passes from a Quadrature with the Sun to a Syzygy; but this is to be subtracted from it, while the Apogee moves from the Syzygy to the Quadrature.

There is moreover another Equation of the Moon's Motion, which depends on the Aspect of the Nodes of the Moon's Orbit with the Sun: And this is greatest, when her Nodes are in Octants to the Sun, and vanishes quite, when they come to their Quadratures or Syzygies. This Equation is proportional to the Sine of the double Distance of the Node from the next Syzygy, or Quadrature; and at greatest, is but 47 seconds. This must be added to the Moon's mean Motion, while the Nodes are passing from their Syzygies with the Sun to their Quadratures with him; but subtracted while they pass from the Quadratures to the Syzygies.

From the Sun's true Place take the equated mean Motion of the Lunar Apogee, as was above shewed, the Remainder will be the Annual Argument of the said Apogee. From whence the Eccentricity of the Moon, and the second Equation of her Apogee may be compared after the manner following (which takes place also in the Computation of any other Intermediate Equations.)



Let T represent the Earth, TS a Right Line joining the Earth and Sun, T A C B a Right Line drawn from the Earth to the middle or mean Place of the Moon's Apogee, equated as above: Let the Angle S T A be the Annual Argument of the aforesaid Apogee, T A the least Eccentricity of the Moon's Orbit, T B the greatest. Bisect A B in C; and on the Centre C, with the Distance A C describe a Circle A F B, and make the Angle B C F = to the double of the Annual Argument. Draw the Right Line T F, that shall be the Eccentricity of the Moon's Orbit; and the Angle B T F, is the second Equation of the Moon's Apogee required.

In order to whose Determination, let the mean Distance of the Earth from the Moon, or the Semi-diameter of the Moon's Orbit, be 1000000; then shall its greatest Eccentricity T A be 66782 such Parts; and the least T A, 43319. So that the greatest Equation of the Orbit, viz. when the Apogee is in the Syzygies, will be 7 deg. 39 min. 30 seconds, or perhaps 7 deg. 40 min. (for I suspect there will be some Alteration according to the Position of the Apogee in *Cancer* or *Capricorn*). But when it is in Quadrature to the Sun, the greatest Equation aforesaid will be 4 deg. 57 min. 56 seconds; and the greatest Equation of the Apogee 12 deg. 15 min. 4 seconds.

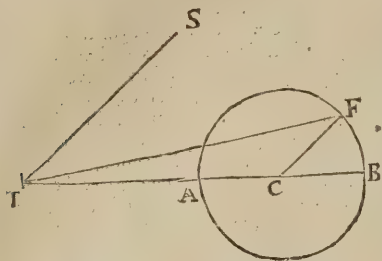
Having from these Principles made a Table of the Equation of the Moon's Apogee, and of the Eccentricities of her Orbit to each Degree of the Annual Argument, from whence the Eccentricity T F, and the Angle B T F (viz. the second and principal Equation of the Apogee) may easily be had for any Time required; let the Equation thus found be added to the first Equated Place of the Moon's Apogee, if the Annual Argument be less than 90 Degrees, or greater than 180 Degrees, and less than 270; otherwise it must be subtracted from it; and the Sum or Difference shall be the Place of the Lunar Apogee secondarily equated; which being taken from the Moon's Place equated a third time, shall leave the mean Anomaly of the Moon corresponding to any given Time. Moreover, from this mean Anomaly of the Moon, and the before-found Eccentricity of her Orbit, may be found (by means of a Table of Equations of the Moon's Centre made to every Degree of the mean Anomaly, and some Eccentricities, viz. 45000, 50000, 55000, 60000 and 65000) the *Prosthaphæresis* or Equation of the Moon's Centre, as in the common way: And this being taken from the former Semi-circle of the middle Anomaly, and added in the latter to the Moon's Place thus thrice equated, will produce the Place of the Moon a fourth time equated.

The greatest Variation of the Moon (viz. that which happens when the Moon is in an Octant with the Sun) is nearly, reciprocally as the Cube of the Distance of the Sun from the Earth. Let that be taken 37 min. 23 seconds, when the Sun is in *Perigæo*, and 33 min. 40 seconds, when he is in *Apogæo*: and let the Differences of this Variation in the Octants be made reciprocally as the Cubes of the Distances of the Sun from the Earth; and so let a Table be made of the aforesaid Variation of the Moon in her Octants (or its Logarithms) to every Tenth, Sixth or Fifth Distance of the mean Anomaly: and for the Variation out of the Octants, make, as Radius to the Sine of the double Distance of the Moon from the next Syzygy or Quadrature: so let the aforesaid Variation in the Octant be to the Variation congruous to any other Aspect; and this added to the Moon's Place before-found in the first and third Quadrant (accounting from the Sun) or subtracted from it in the second and fourth, will give the Moon's Place equated a fifth time.

Again, as Radius to the Sine of the Sum of the Distances of the Moon from the Sun, and of her Apogee from the Sun's Apogee (or the Sine of the Excess of that Sum above 360 deg.): so is 2 min. 10 seconds, to a sixth Equation of the Moon's Place, which must be subtracted, if the aforesaid Sum or Excess be less than a Semi-Circle, but added, if it be greater. Let it be made also, as Radius to the Sine of the Moon's Distance from the Sun: so 2 deg. 20 seconds to a seventh Equation: which, when the Moon's Light is increasing, add; but when decreasing, subtract; and the Moon's Place will be equated a seventh time, and this is her Place in her proper Orbit.

Note here, The Equation thus produced by the mean Quantity 2 degrees 20 seconds, is not always of the same Magnitude, but is increased and diminished according to the Position of the Lunar Apogee. For if the Moon's Apogee be in Conjunction with the Sun's, the aforesaid Equation is about 54 seconds greater: But when the Apogees are in Opposition, 'tis about as much less; and it librates between its greatest Quantity 3 minutes 14 seconds, and its least 1 minute 26 seconds. And this is when the Lunar Apogee be in Conjunction or Opposition with the Sun's: But in the Quadratures, the aforesaid Equation is to be lessened about 50 seconds, or one minute, when the Apogees of the Sun and Moon are in Conjunction; but if they are in Opposition, for want of a sufficient Number of Observations, I cannot determine whether it is to be lessened or increased. And even as to the Augment or Decrement of the Equation, 2 minutes 20 seconds above-mentioned, I dare determine nothing certain, for the same Reason, viz. the want of Observation accurately made.

If the sixth and seventh Equations are augmented or diminished in a reciprocal Ratio of the Distance of the Moon from the Earth, i. e. in a direct Ratio of the Moon's Horizontal Parallax; they will become more accurate: And this may readily be done, if Tables are first made to each Minute of the said Parallax, and to every sixth or fifth Degree of the Augment of the sixth Equation for the sixth, as of the Distance of the Moon from the Sun, for the seventh Equation.



From the Sun's Place, take the mean Motion of the Moon's ascending Node, equated as above; the Remainder shall be the Annual Argument of the Node, whence its second Equation may be computed after the following manner in the preceding Figure.

Let *T*, as before, represent the Earth; *T S* a Right Line conjoining the Earth and Sun: Let also the Line *T A C B*, be drawn to the Place of the Ascending Node of the Moon, as above equated; and let *S T A* be the Annual Argument of the Node. Take *T A* from a Scale, and let it be to *A B* :: as 56 to 3, or as $11\frac{2}{3}$ to 1. Then bisect *BA* in *C*, and on *C* as a Centre, with the Distance *CA*, describe a Circle as *A F B*, and make the Angle *B C F*, equal to double the Annual Argument of the Node before found: So shall the Angle *B T F*, be the second Equation of the Ascending Node: Which must be added when the Node is passing from the Quadrature to a Syzygy with the Sun, and subtracted when the Node moves from a Syzygy towards a Quadrature. By which means the true Place of the Node of the Lunar Orbit will be gained: Whence from Tables made after the common way, the Moon's Latitude, and the Reduction of her Orbit to the Ecliptick, may be computed, supposing the Inclination of the Moon's Orbit to the Ecliptick, to be 4 deg. 59 min. 35 seconds, when the Nodes are in Quadrature with the Sun; and 5 deg. 17 min. 20 seconds, when they are in the Syzygies.

And from the Longitude and Latitude thus found, and the given Obliquity of the Ecliptick, 23 degrees 29 minutes, to the Right Ascension and Declination of the Moon will be found.

The Horizontal Parallax of the Moon, when she is in the Syzygies at a mean Distance from the Earth, I make to be 57 min. 30 seconds, and her Horary Motion 33 min. 32 seconds, 32 thirds; and her apparent Diameter 31 min. 30 seconds. But in her Quadratures, at a mean Distance from the Earth, I make the Horizontal Parallax of the Moon to be 59 min. 40 seconds, her Horary Motion 32 min. 12 seconds, 2 thirds, and her apparent Diameter 31 min. 3 seconds. The Moon in an Octant to the Sun, and at a mean Distance, hath her Centre distant from the Centre of the Earth about $60\frac{1}{2}$ of the Earth's Semi-diameters.

The Sun's Horizontal Parallax I make to be 10 seconds, and its apparent Diameter at a mean Distance from the Earth, I make 32 minutes, 15 seconds.

The Atmosphere of the Earth, by dispersing and refracting the Sun's Light, casts a Shadow as if it were an Opaque Body, at least to the height

of 40 or 50 Geographical Miles (by a Geographical Mile, I mean the sixtieth part of a Degree of a great Circle, on the Earth's Surface.) This Shadow falling upon the Moon in a Lunar Eclipse, makes the Earth's Shadow be the larger or broader. And to each Mile of the Earth's Atmosphere, is correspondent a Second in the Moon's Disk, so that the Semi-diameter of the Earth's Shadow projected upon the Disk of the Moon, is to be encreased about 50 seconds: Or which is all one, in a Lunar Eclipse, the Horizontal Parallax of the Moon is to be encreased in the Ratio of about 70 to 69.

Thus far the Theory of this Incomparable Mathematician. And if we had many Places of the Moon accurately observed, especially about her Quadratures, and these well compared with her Places at the same time calculated according to this Theory; it would then appear whether there yet remain any other sensible Equations, which, when accounted for, might serve to improve and enlarge this Theory.

Dr. Greg. Astr. Elem. Phys. & Geom.

pag. 336.

MOOR at Sea, signifies the laying out the Anchors of a Ship so, as is best and safest for her Riding. There are several ways of *Mooring* a Ship. Sometimes they *Moor her a Toward*, by laying one Anchor on one side of a River, and another right against it on the other side; in order to make both the Cables bear together, as well at Tide of Ebb, as at Flood.

To *Moor Alongst*, is to lay one Anchor right in the middle of the Stream, and another right a head of the Ship, which is done when they are in danger of driving ashoar; for by this Means both her Anchors do bear together, and so will save her from falling on either Shore.

To *Moor Water-foot*, is to Moor a Ship in the middle between the two former ways, quartering as it were, neither across the Tide, nor alongst it, but between both. When a Ship comes into a Place of Riding, the Master and his Mates observe on what Point of the Compass the Wind is likeliest to endanger the Ship, and there they lay out an Anchor; and this is called *Mooring for East, North, &c.* according to the Point she is Moored upon. They don't say a Ship is *Moored*, unless she have at least two Anchor's out; except in one Case, and that is, when, tho' she have but one Anchor out, yet there is a Hawser ashoar; and then they say she is Moored with her Head to the Shoar.

MOORSHEAD, is the Head of a Copper, or Glas-Still, or Alembick, which is luted on to the Body, or Cucurbit; and hath a Beak, Nose, or Pipe, to let the raised Spirit run down into the Receiver.

MOOT, is a Term well understood in the Inns of Court, to be that Exercise or Arguing of Cases, which young Students perform at appointed times, the better to enable them for Practice, and Defence of Clients Causes. In the Inns of Court, there is a *Bayliff*, or *Surveyor of the Inns*, yearly chosen by the Bench, to appoint the *Moot-men* for the Inns of *Chancery*, and to keep account of Performance of Exercises, both there and in the Houle.

MOOT.

MOOT-MEN, are those that argue Reader's Cases (or Moot-Cases) in the Houses of *Chancery*, both in Term-time, and also in Vacations.

MORAL Quantity. See *Quantity*.

MORATUR or *Demoratur in Lege*, signifies as much as *He demurs*, because the Party goes not forward in Pleading, but rests upon the Judgment of the Court in the Point, who deliberate, and take time to argue and advise thereupon.

MORBUS Regius, the same that *Icterus*.

MORTAR-PIECE, is a kind of very short piece of Cannon, or Ordnance, thick and wide, proper for the discharging of Bombs, Carcasses, Stones, &c. It is usually mounted on a Carriage, the Wheels whereof are very low. *Mr. Anderson*, in his Book of the Gun, saith, That 70 or 80 Degrees of Elevation, is the best for ren-

dring Mortars serviceable, to cast Shells into Towns, Forts, &c. And he saith, That if Mortar-pieces were all, as they ought to be, exactly Similar, and their Requisites of Powder as the Cubes of the Diameters of their several Bores; and if also their Shells, Bombs, Carcasses, &c. were Similar, then, comparing, like with like, their Ranges upon the Plane of the Horizon under the same Degree of Elevation, would be equal; and consequently one Piece being well proved, that is, the Range of the Granado, Bomb, Carcass, &c. being found to any Degree of Elevation, the whole Work of the Mortar-piece would become very easie and exact: But since Mortars are not thus Similar, there is required the Range of the Piece at any convenient degree of Elevation, with its requisite of Powder; and then you must work by the Tables,

A T A B L E

MOR

MOR

A TABLE of Horizontal DISTANCES.

D.M	Nu.Diff.	D.M	Nu.Diff.	D.M	Nu.Diff.	D.M	Nu.Diff.	D.M	Nu.Diff.	D.M	Nu.Diff.
30	521	30	5406	30	8851	30	9996	30	8523	30	4806
1	711	16	5550	31	8930	46	9989	61	8431	76	4656
30	892	30	5692	30	9006	30	9979	30	8337	30	4502
2	1069	17	5832	32	9079	47	9966	62	8240	77	4347
30	1244	30	5970	30	9150	30	9950	30	8141	30	4190
3	1417	18	6107	33	9219	48	9931	63	8040	78	4033
30	1589	30	6242	30	9284	30	9909	30	7937	30	4876
4	1759	19	6375	34	9346	49	9884	64	7830	79	3714
30	1929	30	6506	30	9407	30	9856	30	7720	30	3553
5	2097	20	6635	35	9464	50	9825	65	7609	80	3391
30	2264	30	6763	30	9518	30	9791	30	7496	30	3228
6	2431	21	6889	36	9569	51	9755	66	7380	81	3063
30	2597	30	7012	30	9618	30	9715	30	7262	30	2898
7	2763	22	7134	37	9664	52	9673	67	7142	82	2732
30	2927	30	7253	30	9707	30	9628	30	7021	30	2566
8	3090	23	7370	38	9747	53	9579	68	6896	83	2398
30	3253	30	7485	30	9784	30	9528	30	6770	30	2230
9	3415	24	7598	39	9818	54	9475	69	6642	84	2061
30	3575	30	7709	30	9850	30	9417	30	6511	30	1891
10	3734	25	7817	40	9878	55	9358	70	6379	85	1721
30	3892	30	7923	30	9904	30	9295	30	6245	30	1550
11	4050	26	8027	41	9926	56	9230	71	6109	86	1379
30	4206	30	8129	30	9946	30	9162	30	5971	30	1208
12	4361	27	8227	42	9962	57	9091	72	5832	87	1036
30	4514	30	8323	30	9976	30	9018	30	5691	30	864
13	4665	28	8418	43	9987	58	8942	73	5547	88	691
30	4816	30	8510	30	9995	30	8864	30	5403	30	519
14	4966	29	8599	44	9999	59	8782	74	5257	89	346
30	5114	30	8686	30	10001	30	8698	30	5109	30	173
15	5261	30	8769	45	10000	60	8612	75	4959	90	000

The Use of which Table of Horizontal Distances, is this, in Anderfon's Words.

I. Any degree of Elevation under 45 degrees, being given; What degree above 45 degrees, will hit the same Horizontal Distance? Suppose 12 degrees: I look against 12 in the Table, and find 4361, which I look for beyond 45 degrees, and find it against 76 degrees 57 minutes: So I conclude, a Piece charged with the same quantity of the same Powder, and the same Ball put to either 12 degrees, or 76 degrees 57 minutes of Elevation, will range the Shot to the same Horizontal Distance.

Here Note, Suppose a Piece be charged with 1, 2, 3, and 4 Parts of Powder, and the same Ball, and put to those degrees of Elevation, if the upper and lower Ranges be equal, there is no sensible Resistance of the Medium.

II. June the 5th. 1677. on *Wimbleton-Heath*, I charged the Mortar-piece with 4 Ounces of Powder, and put it to 15 degrees of Elevation; it ranged the Ball to the Horizontal Distance of 659 Paces; with that, I would hit a Mark with the same Piece, Ball, and quantity of Powder, at the Horizontal Distance of 1000 Paces: Then as 659 is to 1000, so is 5261 the Tabular Number of 15 degrees to 7983, which gives in the Table 25 degrees 47 minutes, and 63 degrees 16 minutes, to hit a Mark at the Horizontal Distance of 1000 Paces.

III. Feb. the 12th. 1677. on *Wimbleton-Heath*, a Piece whose Length of its Chase is 18 Inches, and Diameter of Bore 3 Inches, charged with 8 Ounces of Powder, and laid to 10 degrees of Elevation, ranged its Shot to the Horizontal Distance of 805 Paces: With that I would hit a Mark at the Horizontal Distance of 2112 Paces; that is, 2 *Englisch* Miles. Then as 805 is to 2112, so is 3734, the Tabular Number at 10 degrees, to 9797, which gives in the Table 38 degrees 41 minutes, and 50 degrees 25 minutes, to hit a Mark at the Horizontal Distance of 2112 Paces, viz. 2 *Englisch* Miles.

N. B. Since this, our Excellent Mathematical Instrument-maker, Mr. *John Rowley*, (whose Shop is by *St. Dunstan's Church in Fleet-street*) hath contrived this Table on a Scale of Box, where, by sliding only a fiducial Edge of Brass over the Diagonals of the Distance required, both the Elevations, upper and lower, are shewn at the same time.

Mr. *Anderfon* gives us also the following TABLE of the Requisite Weight of Powder for all Mortars, from 6 to 20 Inches Diameter.

Inc.	Docim.	Pounds.	Ounces.
6.	0		13
6.	5	1.	01
7.	0	1.	05
7.	5	1.	10
8.	0	2.	00
8.	5	2.	06
9.	0	2.	14
9.	5	3.	06
10.	0	3.	14 $\frac{1}{2}$
10.	5	4.	08
11.	0	5.	03
11.	5	5.	15
12.	0	6.	12
12.	5	7.	10
13.	0	8.	09
13.	5	9.	10
14.	0	10.	11 $\frac{1}{2}$
14.	5	11.	14
15.	0	13.	03
15.	5	14.	09
16.	0	16.	16
16.	5	17.	09
17.	0	19.	03
17.	5	20.	15
18.	0	22.	12 $\frac{1}{2}$
18.	5	24.	11
19.	0	26.	13
19.	5	28.	14
20.	0	31.	04

The Use of this TABLE is Plain and Easy.

If you would know the Quantity of Powder requisite to load a Mortar of 15 Inches Diameter; against 15 Inches you have 13 Pounds 3 Ounces, and that is the true Weight of Powder required.

MORTGAGE, in Law, signifies a Pawn of Land, or Tenements, or any thing moveable, laid or bound for Money borrowed, to be the Creditors forever, if the Money be not paid at the Day agreed upon: And the Creditor holding Land, or Tenement upon this Bargain, is called Tenant in Mortgage. He that pledgeth this Pawn or Gage, is called the Mortgager, and he that taketh it, the Mortgagee.

MORTIFY. The Chymists say a Thing is Mortify'd, when its outward Form is altered or destroyed, as particularly when *Mercury*, or any other Metal is dissolved in an *Acid Menstruum*. Sometimes they say also, that Spirits are Mortified, when they are mix'd with such Things as destroy their Strength, and hinder their Operation.

MORTMAINE, a Term in Law, signifying an Alienation of Lands and Tenements to any Guild, Corporation, or Fraternity, their Successors, as Bishops, Parsons, Vicars, &c. which may not be done without the King's Licence, and the Lord of the Manor, or of the King alone, if it be immediately holden of him.

MORTUARY, is a Gift left by a Man at his Death, to his Parish-Church, for the recompence of his Personal Tythes and Offerings, not duly paid in his Life-time. A *Mortuary* is not properly and originally due to an Ecclesiastical Incumbent from any, but those only of his own Parish. But by Custom in some Places of this Kingdom, they are paid to the Parsons of other Parishes, as the Corps passes through them.

MOSAICK Work, was anciently used only in Pavements, and began in *Rome* about *Sylla's* time; who made a Pavement of *Mosaick Work* at *Preneste* in the Temple of *Fortune*, about 170 Years before Christ. It was called *Lithostrotion*, in Greek only a Stone Pavement; but it is understood of Figures made or represented by inlaying of small Stones, or rather pieces of Stone of different Colours; by the variety of which, many Curious Figures may be wrought. Afterward it came to be in Fashion for the Insides of the Walls of Rooms; and now adays they work it with Shells, or small Pieces of Glas variously Colour'd and Figured: 'Tis a very pleasant and a lasting Ornament, when 'tis curiously and excellently done.

MOTHER Tongues, in *Latin*, *Matrices Linguae*, are such Languages as seem to have no Dependence upon, Derivation from, or Affinity with one another. 'Tis a Conjecture commonly received, That at the Confusion of Languages at the Tower of *Babel*, there were formed 70, or 72 severally distinct Languages: But Bishop *Wilkins* thinks 'tis probable there were not so many, and that at the first Dispersion, Men did not divide into so many Colonies. But now the Languages used in the World, do far exceed that Number: If you will believe *Pliny* and *Strabo*, there was a Town in *Colchos* called *Discuria*, to which Men of three hundred Nations, and as many several Languages, did resort for Trading. Some of the *American* Historians relate, That in every 80 Miles of that vast Country, and also in almost every particular Valley of *Peru*, the Inhabitants had a distinct Language or Mother-Tongue by themselves. And *Purchas* tells us, *Pilgr. Lib. 8. Sect. 4. Cap. 1.* That by Converse and Enquiry, in the Northern Parts of *America*, about *Florida*, he found more than 1000 different Languages amongst the Inhabitants of those Places.

Joseph Scaliger affirms there are no more than Eleven Mother-Tongues used in *Europe*; of which Four are of more general and large Extent, and the other Seven of a narrower Compass and Use.

1. The *Greek*, which was anciently of very great Extent, not only in *Europe*, but in *Asia* and *Africk* too, where several Colonies of that Nation were planted; by which Dispersion and Mixture with other People, it did degenerate into several *Dialects*. Besides those Four that are commonly noted, the *Doric*, *Ionic*, *Eolic*, *Attic*, *Herodotus* doth mention Four several *Dialects* of the *Ionic*. The Inhabitants of *Rhodes*, *Cyprus*, *Crete* had each of them some Peculiarity in their Language:

And the present *Coptic* or *Egyptian* seems, both from the *Words* and the *Character*, to be a Branch of this Family, and was probably spread amongst that People in the Days of *Alexander the Great*, upon his conquering of them; tho' some conceive that there were at least 30000 Families of *Greeks* planted in that Country long before his Time.

2. The *Latin*, tho' this be much of it a Derivation from the *Greek*, (of which the now *French*, *Spanish*, and *Italian*, are several Off-springs and Derivations) had anciently Four several *Dialects*, as *Petrus Crinitus* shews out of *Varro*.

3. The *Teutonic* or *German*, is now distinguished into *Upper* and *Lower*. The *Upper* hath two notable *Dialects*: 1. The *Danish*, *Scandian*, or perhaps the *Gothic*; to which belongs the Language used in *Denmark*, *Norway*, *Swedeland*, and *Island*. 2. The *Saxon*, to which appertain the several Languages of the *English*, the *Scotch*, the *Frisians*, and those on the North of *Elbe*.

4. The *Slavonic* is extended, tho' with some Variation, through many large Territories, *Muscovia*, *Poland*, *Bohemia*, *Vandalia*, *Croatia*, *Lithuania*, *Dalmatia*; and is said to be the *Vulgar Language* used amongst Sixty several Nations.

The Languages of lesser Extent, are,

1. The *Albanese*, or Old *Epirotic*, now used in the Mountainous Parts of *Epirus*.

2. The *European Tartar*, or *Scythian*, from which some conceive our *Irish* to have had its Original.

As for the *Turkish Tongue*, that is originally no other but the *Asiatick Tartar* mixed with *Armenian* and *Persian*, some *Greek*, and much *Arabic*.

3. The *Hungarian*, used in the greatest Part of that Kingdom.

4. The *Finnic* used in *Finland* and *Lapland*.

5. The *Cantabrian*, used amongst the *Biscainers* who live near the Ocean on the *Pyrene Hills*, bordering both upon *France* and *Spain*.

6. The *Irish*, in *Ireland*, and from thence brought over into some Parts of *Scotland*; tho' *Mr. Camden* would have this to be a Derivation from the *Welsh*.

7. The Old *Gaulish* or *British*, which is yet preserved in *Wales*, *Cornwal*, and *Britain* in *France*.

To this Number *Mr. Brerewood* doth add Four others, viz.

1. The *Arabick*, now used in the steep Mountains of *Granata*; which yet is a *Dialect* from the *Hebrew*, and not a Mother-Tongue.

2. The *Cauchian*, in *East-Friesland*.

3. The *Illyrian*, in the Isle of *Veggia*.

4. The *Fazzygian*, on the North-side of *Hungary*.

MOTION, is a continual and successive Mutation or Change of Place. All Motion may be consider'd either *Absolutely* or *Relatively*. *Absolute Motion* is the Change of the *Locus Absolutus* of any moving Body, and therefore its Celerity will be measured by the Quantity of the *Absolute Space*, which the Moveable hath run through. But *Relative Motion* is a Mutation of the *Relative* or *Vulgar Place* of the moving Body, and so hath its Celerity accounted or measured by the Quantity of *Relative Space* which the Moveable runs over.

All Motion is of it self rectilinear, or made according to strait Lines, with the same constant uniform Velocity, if no external Cause make any Alteration in its Direction.

If a Body, moving uniformly, and with the same Degree of Velocity, pass over two Spaces, the Times of the Motions will be as the Spaces; as is very plain to him that will consider it.

If a Body move through two Spaces in equal Times, those Spaces will be to one another as the Velocities of the Motions.

If two Bodies move uniformly, but with unequal Velocities, through the same Space, the Times will be as the Velocities.

If two Bodies, moving uniformly, go with unequal Velocities, the Spaces which will be pass'd over by them in unequal Times, will be to one another in a Ratio compounded of that of the Velocities and that of the Times. *Galileus, de Motu Local. Dial. 3. Giorn. terza.*

If any Bodies are impelled upwards by different Forces, they will be rais'd to different Heights; which Heights will be to one another as the Squares of their Velocities.

And if Bodies fall from different Altitudes, the Celerities will be to one another as the Squares of such Altitudes.

M O T I O N ; Its Laws.

The Incomparable Sir *Isaac Newton* gives but these Three Laws of Motion, which may be truly call'd *Laws of Nature*.

1. That every Body will continue in its State, either of Rest, or Motion uniformly forward in a Right Line, unless it be made to change that State by some Force impress'd upon it.

2. That the Change of Motion is proportionable to the moving Force impress'd; and is always according to the Direction of that Right Line in which the Force is impress'd.

3. That *Reaction* is always equal and contrary to *Action*; or, which is all one, the mutual Actions of two Bodies one upon another are equal, and directed towards contrary Parts: As when one Body presses and draws another, 'tis as much press'd or drawn by that Body.

The Quantity of any Motion is discoverable by the joint Consideration of the Quantity of Matter in, and the Velocity of the moving Body: For the Motion of any Whole, is the Sum of the Motions of all the Parts. And consequently if a Body be twice as great as another, and be moved with an equal Degree of Velocity, the

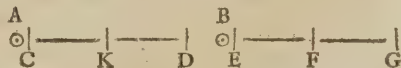
Quantity of the Motion is *double* in the Former; but if the Velocity be also double, then the Quantity of the Motion is *Quadruple* of that of the latter. *Newton's Princip.*

The Quantity of Motion, which is found by taking either the Sum of Motions made the same way, or the Difference of those which are made contrary ways, is not at all changed by the Action of Bodies one upon another. For Action and Reaction are always equal, (by Law 3.) wherefore (by Law 2.) they must needs produce equal Changes in the Motions towards contrary Parts: Wherefore, if the Motions be both according to the same Direction, whatsoever is added to the Body to be moved, or which is forced to give place, is subducted from the Body which moves, or drives away the other; so that the Sum remains the same as before. But if the Bodies meet with contrary Directions, there must be an equal Subtraction of the Motion of each, and consequently the Difference of the Motions made towards the contrary parts, will remain the same. Suppose the Spherical Body A to be thrice as big as B, and of the like Figure. Let A have two Degrees of Velocity, and B pursue it with ten Degrees of Velocity: Wherefore the Quantity of the Motion of A to B, is as 6 to 10; therefore the Sum of the Motions of both is 16. Suppose then B to overtake A, and to give it 3, 4, or 5 Degrees of Velocity; 'tis plain it must lose just as much it self: Wherefore A will go on with 9, 10, 11 Parts of Velocity; and B will follow after with 7, 6, or 5. So that the Sum will still be 16; and thus will it always be. *Idem.*

Mr. *Keil*, in his *Lectiones Physicae*, proves this distinctly, by branching of it into two Theorems. See p. 127.

Which T H E O R E M S are these.

I: If one Body strike against another, whether at rest, or moving more slowly, according to the same Direction with the Former; then will the Sum of the Motion in both Bodies towards the same Parts, remain the very same as before such striking one against another.



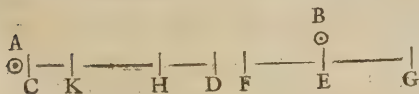
Let the Body A move according to the Direction CD, and in its way strike against the Body B; which suppose to be either at rest, or moving on more slowly than A, and according to the same Direction with it: I say, the Sum of the Motions in both Bodies, towards the same Parts, that is from C towards D, will be the same as before. Let CD express the Motion of A from C to D; and if B be in Motion too, let EF express its Motion the same way. Then will the Sum of both Motions be expressed by $CD + EF$. But because Action and Reaction are always equal, and towards Contrary Parts; if FG express the Motion impress'd on B by the Stroke of A; DK, equal to it, must express the Motion impress'd on A by the Stroke of B, with a contrary Direction from D towards C. Wherefore since $DK = FG$, CK will express the Motion of the Body A after the Shock, and EG the Motion of B; and therefore the Sum of

of both will be $CK + EG$. But since FG is supposed $= KD$, if you add CK and EF to both, $EG + CK$ must be equal to $CD + EF$. Wherefore the Sum of the Motions of both is the same as at first.

And if FG be equal to CD , the Points K and C must be coincident; that is, CK will be $= 0$, and consequently the Body A , after the Occurſe or Shock, will be quite at reſt. But if FG be greater than CD , the Point K must be found ſomewhere beyond or to the Left Hand of C ; and the Motion of A will become changed towards the contrary Parts, and the Sum of the Motions towards G will be as $EG - CK$: And becauſe $FG = CK$, add to both $EF - CK$, and it will be that $EF + FG - CK$, (*i. e.*) $EG - CK = EF + DK - CK$, (*i. e.*) $EF + CD$. From whence 'tis plain that the Sum of the Motions towards the ſame Parts (which in this Caſe is their Difference towards contrary Parts) continues the ſame after the Shock as before.

COR. After the ſame manner it will appear, if many Bodies, moving with the ſame Direction, ſhould ſtrike againſt one another, the Sum of their Motion, after that, will be the ſame as before.

II. If Two Bodies move towards each other with exactly contrary Directions, the Sum of their Motions towards the ſame Parts (which is all one as the Difference of them towards contrary Parts) will continue the ſame after the Shock as before it.



Let the Body A move from C towards D , and let CD expreſs its Line of Motion; and let the Body B be moving at the ſame time with a quite contrary Direction from E to F , and let EF expreſs its Motion. Let DH be ſuppoſed equal to EF ; ſo ſhall CH , which is the Difference of their Motion towards contrary Parts, expreſs the Sum of the Motions made towards G . I ſay then, that the ſame CH is the Sum of their Motions towards G , as well after the Shock as before it: For after the Shock, ſuppoſe the Motion of B to be changed, and to be now towards G , and let the Line EG repreſent it; wherefore the Force impreſſed upon B after the Shock, and which carries it towards G , will be equal to the Sum of the Motions EF and GF , and confequently be expreſſed by FG : For in that Right Line, the Motion EF , towards F , is deſtroyed; and the new one, EG , towards G , produced. But now ſince the impulſive Force in both Bodies acts equally towards contrary Parts, if DK be made equal to FG , this ſhall repreſent the Force impreſſed on the Body A , and carry it in a contrary Direction to its former Motion: So that if the Line of Motion DK , be taken from the Line CD , there will remain CK repreſenting the true Motion of A towards G . But becauſe $DK = FG$, and $DH = FE$; $DK - DH$ (*i. e.* KH) $= FG - FE$ (*i. e.*) EG : And confequently ſince $KH = EG$, KH will repreſent the Motion of the Body B , after the Shock;

but CK repreſents the Motion of A after it: Wherefore CA is the Sum of the Motion in both Bodies towards G .

If FG had been equal to CD , then the Points, K and C would be coincident, and the Motion of A will be quite deſtroyed, (*i. e.*) after the Shock A will be perfectly at reſt, and CA will be equal to EG .

But if FG be greater than CD , the Point K will fall to the Left Hand of C , and the Motion of the Body A will be from C towards K . But (becauſe $FG = DK$, and $FE = DH$) $KH = EG$; wherefore taking CK from both, CH must be equal to $EG - CK$; which repreſents the Sum of the Motions made towards the ſame Parts, and their Difference towards contrary ones after the Shock: Wherefore the Sum of the Motions towards the ſame Parts remains the ſame after, as before the Shock.

Our Excellent Mathematician Dr. Wallis, in a Letter to the Famous Mr. Oldenburgh, Secretary of the Royal Society, gives the following Short Account of the Laws of Motion, Nov. 26. 1688. And intimated, that they were made Publick Eight Months before, at the Meeting of the Royal Society.

1. If any Agent, as A , produce any Effect, as E ; then an Agent, as $2A$, will produce an Effect, as $2E$; $3A$, as $3E$, &c. *ceteris paribus*. And univerſally, if m be put for the Exponent of the Power, $m A$, as $m E$.

2. Wherefore if any Force, as V (which ſtands for *Vis*) move any Weight, Maſs, or Body, as P ; the Force, which is as $m V$, ſhall move $m P$, *ceteris paribus*; *viz.* with the ſame Celerity, or through the ſame Space in the ſame Time.

3. If the Force in the given Time T , move any Weight thro' the Space or Length L , in the Time $n T$, it ſhall move it thro' the Space $n L$.

4. Wherefore if the Force V , in the Time T , move any Weight, as P thro' the Length or Space L , the Force $m V$ in the Time $n T$, ſhall move $m P$ thro' the Space $n L$: And confequently as $V T$, (the Rectangle under the Force and Time) is to $P L$ the Rectangle under the Weight and Diſtance: So is $m n V T$, to $m n P L$.

5. Since the Degrees of Celerity are proportionable to the Lengths run over in the ſame Time, or, (which is the ſame thing) are proportionable to the Times taken up in paſſing over ſuch Lengths: Therefore it will be, as $\frac{L}{T}$. $C ::$

$\frac{m L}{n T} \frac{m}{n} C$. That is, the Degrees of Celerity will be in a Ratio compounded directly of the Lengths, and Reciprocally of the Times.

6. Since as $V T . P L :: m n V T$ to $m n P L$, it will be as $V . \frac{P L}{T} :: m V . \frac{m n P L}{n T}$. That is,

$V . P G$.

$V, P C :: m V, m P C :: m P \times \text{by } C ; \text{ or } = P \times \text{by } m C.$

7. That is, if the Force V be able to move the Weight P , according to the Celerity C ; then will the Force $m V$, move the same Weight P , in the Celerity $m C$; or with the bare Celerity C , the Weight $m P$: Or, in one word, it will be able to move any Weight with that Celerity; if the Product of the Weight multiplied by the Celerity, be $m P C$.

8. And on this depends the Reason of the Construction of all manner of Engines and Machines, for facilitating of Motion, viz. That in whatever Proportion the Weight be encreased, the Celerity be decreased accordingly: From whence it comes that the Product of the Celerity multiplied by the Weight, for moving the same Force, is always the same, viz. $V : P C ::$

$N, m P + \frac{1}{m} C$: That is, $P C$.

9. If the Weight P , by the Force V , carried according to the Celerity C , strike directly against the Weight $m P$; which, tho' supposed at rest, yet is capable of being moved; both the Bodies after the stroke, will be carried with the Celerity $\frac{1+m}{1} C$. For, by reason the same Force is impelled to move the greater Body, the Celerity of it will be lessened after the same Ratio, viz. $V : P C :: V : \frac{1+m}{1} P \times \frac{1}{1+m} C = P C$. And therefore the Impetus, (or Product of the Weight multiplied by the Celerity) of the other will be $\frac{1}{1+m} P C$; and of the Remaining one $\frac{1}{1+m} m P C$.

10. If against the Weight P , moved by the Force V , with the Celerity C , another Weight or Body shall strike directly, moving the same way, but with greater Celerity: As suppose the Weight $m P$, with the Celerity $n C$, (which therefore will be carried forward with the Force $m n V$.) After this, they will both move forward with the Celerity $\frac{1+m n}{1+m} C$.

For, $V : P C :: m n V, m n P C :: V + m n V$
 $\left(\frac{1+m n V}{1} \right) \frac{1+m n}{1} P C$: which is equal to
 $\frac{1+m}{1} P \times \text{by } \frac{1+m n}{1+m} C$.

And therefore the Impetus of the Preceding Body will be $\frac{1+m n}{1+m} P C$: and of the following, $\frac{1+m n}{1+m} m P C$.

11. If the Weights or Bodies are carried contrary ways, they will meet, and mutually strike against each other.

Suppose the Weight P , carried by the Force V , with the Celerity C , towards the Right Hand; and the Weight $m P$ with the Celerity $n C$, (and consequently carried by the Force $m n V$) toward the Left Hand: Then may the Impetus,

Direction, and Celerity of each be thus calculated.

The Body which moved towards the Right Hand, if the other had been at rest, would have given it the Celerity $\frac{1}{1+m} C$, (by the 9th);

and consequently the Impetus $\frac{1}{1+m} m P C$, of moving to the Right Hand; and would have retained to it self the same Celerity, and the Impetus $\frac{1}{1+m} m P C$; also towards the Right Hand. And the other Body, carried toward the Left Hand, would, if the former had been at rest, have given it the Celerity $\frac{m n}{1+m} C$; and therefore the Impetus $\frac{m n}{1+m} m P C$, towards the Left Hand, by the same Reason; and it would have retained to its self the same Celerity, and therefore the Impetus $\frac{m n}{1+m} m P C$ also toward the Left Hand.

Wherefore since the Motion was made both ways, the Aggregate of the Impetus of the former Body, will arise out of the Impetus $\frac{1}{1+m} P C$ to the Right, and $\frac{m n}{1+m} P C$ to the Left: And therefore in reality, it will move either to the Right or Left, according as that or this is greater, and by an Impetus, which is the Difference between those 2 Impetus's. That is, Supposing $+$ to signifie to the Right Hand, and $-$ to the Left, the Impetus will be $\frac{1}{1+m} P C - \frac{m n}{1+m} P C$, which is equal to $\frac{1-m n}{1+m} P$. And the Celerity will be $\frac{1-m n}{1+m} C$, (and towards the Right or Left Hand, according as 1 or $m n$ is the greater Quantity.)

And in like manner the Impetus of the other Body, which first moved towards the Left Hand, will be $\frac{1}{1+m} m P C - \frac{m n}{1+m} m P C =$ to $\frac{m n}{1+m} m P C$. And the Celerity will be $\frac{1-m n}{1+m} C$, and the Direction to the Right or Left Hand, according as 1 , or $m n$, is the greater Quantity.

12. But if the Bodies neither move on in the same way directly, nor directly contrary to one another, but do encounter one another Obliquely; then the preceding Calculus must be moderated, according to the Measure of that Obliquity: And the Impetus of the Body striking Obliquely, is to the Impetus it would have had, if it had gone directly :: as the Radius to the Secant of the Angle of the Obliquity.

Which Consideration duly applied to the former Calculus, will determine with what Impetus, Celerity, and Direction, the Obliquely encountering Bodies shall move afterward.

And there is the very same Ratio of the Gravitation of heavy Bodies, which descend Oblique-ly

ly to their Gravitation, supposing them to have descended perpendicularly; as we elsewhere demonstrate.

13. If the Bodies, which thus encounter or strike one against another, are not infinitely hard (as hath hitherto been supposed) but do yield something to the Stroke, but yet so as that by a Spring, or Elastick Force, they can recover their Figure or Position again: It may happen from hence, that those Bodies may rebound back from one another mutually, which otherwise would have moved on together; (and this more or less, according to the Quantity of the Elasticity) viz. if the Elastick Force exceed the Progressive.

In Motions which are accelerated and retarded, the Impetus in each Moment is to be esteemed that which agrees to the degree of Celerity then acquired. But when the Motion is made in a Curve Line, that is to be accounted the Line of Direction of the Motion in each Moment, which is truly the Tangent to the Curve in that Point. And if when the Motion, being either accelerated or retarded, is made in a Curve Line (as in the Vibrations of a Pendulum) the Impetus is to be estimated in each Point, according to both the Degree of Acceleration, and the Obliquity of the Tangent there. *Philosoph. Transact. N. 40.*

An Account of the Laws of Motion, in Bodies striking one against another, you have also from the famous Mr. Hugen, in *Philos. Transact. N. 46.*

Mr. John Keil, late of Baliol-College in Oxon, in his Book called, *Introductio ad veram Physicam*, gives the following Theorems about the Quantity of Motion, and the Spaces passed over by the Moving Body, and which he there plainly demonstrates.

1. In comparing the Motions of Bodies, if the Quantity of Matter be the same, the Moments, or Quantities of Motion, will always be as the Velocities, and *vice versa*, if the Moments are as the Velocities, the Quantity of Matter in the Moving Bodies, is always the same.

2. If the Celerities are equal, the Moments, or Quantities of Motion, will be as the Quantities of Matter; or if the Moving Bodies are Homogeneous, as their Magnitudes.

And if the Moments are as the Quantities of Matter, the Velocities will be equal.

3. In comparing the Motions of any Bodies, the Ratio of the Moments is compounded of the Ratios of the Quantities of Matter, and the Celerities. See the Word *Moments*.

4. In comparing the Motions of any Moving Bodies, the Ratio of the Celerities is compounded of the Ratio of their Moments directly, and of their Quantity of Matter reciprocally.

5. If the Celerities of any Moving Bodies are equal, the Spaces passed over, will be directly as the Times in which the Motions are made.

And consequently, if the Times are as the Spaces, the Celerities must be equal.

6. If the Times are equal, the Spaces passed through, will be as the Velocities, and consequently, if the Spaces are as the Velocities, the Times will be equal.

7. The Distances, or Lengths run, are in a Ratio compounded of the Ratios of the Times and Celerities; so that Spaces or Distances moved thro', may be consider'd as Rectangles, under the Times and the Celerities.

Wherefore if the Spaces, or Distances run, be equal, the Rectangle under the Celerity and Time of one Moveable, will be equal to that under the Celerity and Time of the other: And therefore, because equal Rectangles with unequal Sides, have their Sides reciprocally proportionable (14. & 6 *Euclid.*) as Celerity is to Celerity; so reciprocally shall Time be to Time; and consequently, when the Spaces are equal, the Times will be reciprocally as the Celerities.

8. The Ratio of the Times is always compounded of the Ratio of the Spaces passed over, directly, and of the Celerities reciprocally.

The Incomparable Sir ISAAC NEWTON, thus expresses these Two last Theorems.

When the Celerity is given, the Space passed through will be as the Time; and the Time being given, the Space is as the Celerity: Wherefore if neither be given, the Space will be as the Celerity and Time conjunctly.

When the Celerity is given, the Time is directly as the Space moved through; and the Space being given, the Time is reciprocally as the Celerity: Wherefore if neither be given, the Time is as the Space directly, and as the Celerity reciprocally.

Hence 'tis plain, the Motions of all Bodies are as the Rectangles under the Velocities, and the Quantities of Matter: wherefore the Matter and Celerity of Motion being given, the Momentum or Quantity of Motion is given: And if the Momentum and Matter be given, the Celerity is given by dividing the Momentum by the Quantity of Matter, *v. gr.* Let the Quantity of Matter be a , the Celerity c , and the Momentum m : then will $ca = m$, and $c = \frac{m}{a}$ and $a = \frac{m}{c}$.

Also since the Space passed over, or through, is always proportional to the Rectangle under the Velocity and the Time; let the Space be $= S$, the Time $= T$, and the Celerity as before $= C$. Then will $S = CT$, and $C = \frac{S}{T}$, and $T = \frac{S}{C}$. And since also $m = ac$, m will be equal to $\frac{a S}{T}$: Or, if T be given, $m = aS$.

Hence also may be concluded, That if two Bodies are moved with equal Velocities, the Moments will be as the Quantity of Matter in each; and *vice versa*, the Quantity of Matter as the Moments. Wherefore if Bodies of equal Bulk are found to have unequal Moments, or Quantities

of Motion, the Quantities of Matter must be unequal; and consequently, that which hath the least Moment, must have more of Pores or Vacuities interspersed than the other.

For Instance: If two Globes, one of Lead and the other of Cork, having equal Bulks, are moved with equal Swiftness; since the Quantity of Motion in the former, or its Force to move other Bodies, will be much greater than in the latter; it's plain there must be many more Pores or Vacuities in this; than in that.

Mr. Varignon's Laws and Proportions about Motion.

1. In all kind of Motions whatever, Rowling, Sliding, Uniform, Accelerated, or Retarded, in Right Lines, or in Curves, &c. The Sum of the Forces which produce the Motion of all Parts of its Duration, is always proportionable to the Sum of the Paths, or Lines, which all the Points of the moving Body describe.

2. There is more Force required to make a Body Rowl, or Revolve, (as suppose a truly Spherick Bowl on a mathematical Plane) than to make it Glide along with the same Celerity.

3. In all Gliding or Sliding Motions, whether Uniform, Accelerated, or Retarded, &c. The Force in the whole is always proportional to the Product of the Mass (or Quantity of Matter) multiplied by the Path or Line described by the Centre of Gravity of the moving Body.

4. The Product of the Duration of all Uniform Motions, multiplied by the Force which began the Motion, is always proportionable to the Product made by the Path, or Line of Motion multiplied by the Mass or Quantity of Matter in the moving Body.

Let B, b. stand for the Body moved.
M, m. for the Mass, or Quantity of Matter in it.
S, s. for Space, or Distance moved through.
T, t. for the Time in which the Motion is made.
F, f. for the Force producing the Motion.
C, c. for the Celerity of the Motion.

Then I say, $FT : ft :: MS : ms$. of any two Bodies in Motion. Then

$$\begin{aligned} 5. F : f :: MS : ms \\ T : t :: MS : ms \\ M : m :: FT : ft \\ S : s :: FT : ft \end{aligned}$$

6. If $F = f$, then shall

$$\begin{aligned} T : t :: MS : ms \\ M : m :: TS : st \\ S : s :: TM : Mt \end{aligned}$$

And reciprocally, Whenever T t, M m, S s, are in any of these Proportions, Then are the Forces which move the Bodies equal; which is the General Principle of all Des Cartes's Statics.

7. If $T = t$, then shall

$$\begin{aligned} F : f :: MS : ms \\ M : m :: FS : fs \\ S : s :: TM : Mt \end{aligned}$$

And so reciprocally, If F, M, or S, be in the Proportions, The Times will be equal. And from this may the Laws of all Machines be demonstrated after Des Cartes his manner.

8. If $M = m$, then will

$$\begin{aligned} F : f :: S : s \\ S : s :: FM : fm \\ T : t :: Sf : sF \end{aligned}$$

And reciprocally, If these Proportions be discovered, Then the Masses are equal.

9. If $S = s$, then will

$$\begin{aligned} F : f :: MT : mT \\ M : m :: FT : ft \\ T : t :: Mf : mF \end{aligned}$$

And reciprocally, If such Proportions are found, The Spaces are equal.

$$10. \text{ If } F : f :: \begin{cases} M : m \\ S : s \end{cases}$$

Then will

$$T : t :: \begin{cases} S : s \\ M : m \end{cases}$$

And reciprocally,

$$\text{ If } T : t :: \begin{cases} S : s \\ M : m \end{cases}$$

Then will

$$F : f :: \begin{cases} M : m \\ S : s \end{cases}$$

11. If $F : f :: T : t$. Then

$$\begin{aligned} M : m :: FF : ff \\ S : s :: TT : tt \\ MS : ms :: FF : ff \\ TT : tt :: MS : ms \end{aligned}$$

And reciprocally, If the Masses of the Bodies moved, or the Spaces run through, or the Products of the Masses, by the Spaces, (that is, the Quantity of Motion in the Bodies B and b) are as in these Proportions, then are the Forces to one another as the Times.

And this observe also for a Principle to explain Machines and Engines, as above in Numbers 6 and 7.

12. If $M : m :: S : s$. Then

$$\begin{aligned} F : f :: SS : ss \\ T : t :: MM : mt \\ FT : ft :: SS : ss \\ MT : mt :: MM : mF \end{aligned}$$

And

MOT

S f f ... And

And Reciprocally, If these last Proportions are true, the first are so also.

24. If $F : f :: T : t$. Then shall

$$\begin{aligned} C : c :: m T : M t. \\ T : t :: M C : m c. \\ M : m :: T c : t C. \end{aligned}$$

And Reciprocally, If the Celerity, or the Masses, or the Times, or the Forces, are as in these Proportions, then the Forces shall be to one another as the Times; which was the Principle of *Galileus*, mentioned before in Number 20.

25. If $M : m :: S : s$. Then shall

$$\begin{aligned} C : c :: F s : f S. \\ F : f :: S C : s c. \\ S : s :: F c : f C. \end{aligned}$$

And Reciprocally, If the Celerities, or the Forces, or the Masses, or the Spaces run thro', are as in these Proportions; then the Masses of the Bodies moved, are to one another as the Spaces run thro'.

26. If $F : f :: m :: M$. Then $C : c :: \begin{cases} m m : M M \\ F F : f f. \end{cases}$

And Reciprocally, If these last Proportions are true, the first must be so also.

27. If $T : t :: s : S$. Then $C : c :: \begin{cases} S S : s s. \\ t t : T T. \end{cases}$

And Reciprocally,

If $C : c :: \begin{cases} S S : s s \\ t t : T T \end{cases}$ Then shall $T : t :: s : S$.

28. If $F : f :: s : S$. Then

$$\begin{aligned} C : c :: s m : S M. \\ M : m :: c s : C S. \\ s : S :: C M : c m. \end{aligned}$$

And Reciprocally, If the Celerities or the Masses, or the Forces, or the Spaces, are as in the last Proportion; then the Forces shall be Reciprocally as the Spaces.

29. If $T : t :: m : M$. Then

$$\begin{aligned} C : c :: F T : f t. \\ F : f :: t C : T c. \\ T : t :: f C : F c. \end{aligned}$$

And Reciprocally, if the Celerity, or the Forces, or the Times, or the Masses, are as in the last Proportion; then the Times shall be to one another in a Reciprocal Ratio of the Masses.

30. If $\begin{cases} F : f :: t : T. \\ M : m :: s : S. \end{cases}$ Or, Then

$$\begin{aligned} C : c :: F S : f s :: t m : M T. \\ t : f :: s C : S c. \\ t : T :: M C : m c. \\ M : m :: t c : T C. \\ s : S :: F c : f C. \end{aligned}$$

And Reciprocally, If the Celerities, Forces, Times, Masses, or Spaces run thro', are in the last Proportions; then the Masses shall be in a Reciprocal Ratio of the Spaces, and the Forces Reciprocally as the Times: Which is also the same that *Dr. Cartes* took for his first Principle of *Statics*. See the *Memoirs de la Mathematique & de la Physique*.

MOTION of the Apogee, in the *Ptolemaick System*, is an Ark of the Zodiac of the *Primum mobile*, contained between the Line of the Apogee and the Beginning of Aries.

MOTION Compounded. See *Composition of Motion*.

MOTORII, the Third Pair of Nerves which move the Eye.

MOTRIX *Vix*. See *Vis Motrix*.

MOVEABLE Feasts, are those Festivals which, tho' they are Celebrated on the same Day of the Week, have no Fixed Seat in the Calendar, but in several Years happen on several Days of the Month; of which kind are *Easter* and *Whitsontide*, &c.

MOVEMENT, the same with what many do call an Automaton, and with us signifies all those Parts of a Watch, Clock, or any such Curious Engine which are in Motion, and which by that Motion carry on the Design, or answer the End of the Instrument.

The Numbers of the *Wheels*, *Pinions*, *Notches*, &c. in any Piece of Clock or Watch-work, are usually thus written or express'd:

Where the uppermost Number above the Line is the Pinion of the Report 4, the Dial-wheel 36, and 9 the Turns of the Pinion of Report. The second Number (under the Line) is 5 the Pinion, 55 is the great Wheel, and 11 the Turns of the Pinion it driveth. The third Numbers are the second Wheel, &c. The fourth the Contrate-wheel, &c. And the single Number 17, under all, is the Crown-wheel.	<table border="0"> <tr><td>4</td><td>36</td><td>(9)</td></tr> <tr><td colspan="3"><hr/></td></tr> <tr><td>5</td><td>55</td><td>(11)</td></tr> <tr><td>5</td><td>43</td><td>(9)</td></tr> <tr><td>5</td><td>40</td><td>(8)</td></tr> <tr><td colspan="3"><hr/></td></tr> <tr><td></td><td></td><td>17</td></tr> </table>	4	36	(9)	<hr/>			5	55	(11)	5	43	(9)	5	40	(8)	<hr/>					17
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These Numbers, by some, are also express'd Fraction-wise, thus, $\frac{36}{5}$, $\frac{55}{5}$, $\frac{43}{5}$, $\frac{40}{5}$, 17 Notches in the Crown-wheel.

MOULINET, a French Term, signifying a Turn-stile: 'Tis used in Mechanicks, and signifies a Roller, which being cross'd with two Levers, is usually applied to *Cranes*, *Capstans*, and other sort of Engines of the like Nature, to draw Cords, and heave up Stones, Timber, &c. Also a kind of Turn-stile or Wooden Cross, which turns horizontally upon a Stake fix'd in the Ground; and is usually placed in Passages, to keep out Horses, and to oblige Passengers to go or come one by one.

These *Moulinets* are often set up near the Out-works of Fortified Places, at the side of the Barriers, through which People pass on Foot.

MOUND. The Term in Heraldry for a Ball or Globe, with a Cross upon it, such as our Princes are usually drawn or painted with, holding it in their Left Hand, as they do the Sceptre in their Right. Mound also signifies a Fence or Hedge.

MOYENAU (a French Term) in Fortification, is a small flat Bastion, commonly placed in the middle of an over-long Currain, by which the Bastions at the Extremities are not well defended from the Small-shot, by reason of their Distance; so that this Work is proper for placing in it a Body of Musqueteers to fire upon the Enemy from all sides.

MUCILAGE, in Pharmacy, is a viscidous Extraction made of Seeds, Gums, Roots, &c. with Water.

MUCILAGINOUS Glands, are a numerous sort of Glands seated in the Joints, first, I think, particularly taken Notice of by Dr. *Havers*, in his *Osteologia*: He saith, these are of two sorts, some are small, and in a manner miliary Glands, being Glandules placed all upon the same Surface of the Membrane, which lies over the Articulations. The other sort are conglomerated, or many Glandules collected and planted one upon another, so as to make a Bulk, and appear conspicuously, and are considerable Glands. In some of the Joints there are several of them; in others there is a single Gland.

For the Structure of these large Glands, they consist of small Vesicles, which are not gathered into several Lobules or Bags of Glandules, but are disposed upon several Membranes lying one over another; of which Membranes there are several in every one of these Glands, which appear evidently in them that are Hydropical.

They have their Blood-Vessels, as other Glands, but their Veins have a particular Flexure in their Course for retarding the Return of the Blood from the Glands, that the mucilaginous Liquor, which is not separated with the greatest Expedition, may have Time to penetrate the secretory Pores of the Glandules.

The large Mucilaginous Glands are variously seated; some in a *Sinus*, formed in the Joint; others stand near or over-against the Interstice, between the Articulated Bones; but in general they are so placed, as to be squeez'd gently, and lightly press'd in the Inflection or Extension of the Joint, so as to separate a Quantity of Mucilage proportionate to the Motion of the Part, and the present Occasion, and yet without any Injury.

The Design of all these Glands is to separate a mucilaginous kind of Liquor that serves principally to lubricate the Joints, to make them so slippery, as to be moved with the greatest Facility imaginable. It serves likewise to preserve the Ends of the Articulated Bones from Attrition, and an immoderate Incalcescence. But all these Things it performs in Conjunction with the medullary Oyl; of which two Ingredients, is made a Composition admirably fitted for these Ends: For the Mucilage adds to the Lubricity of the Oyl, and the Oyl preserves the Mucilage from growing too thick and viscidous.

The Doctor observes the same sort of Glands to lie between the Muscles and Tendons, and supposes that there is the same Mixture of an Oyl and Mucilaginous Substance; the one being that Fat which is found between the Muscles, and is supply'd by the Adipose Glands; the other being separated by the mucilaginous Glandules, of which the common Membrane of the Muscles is every where full. This Mixture in the Interstices of the Muscles, lubricates them and their Tendons, and preserves them from shrinking, and from growing dry and rigid.

For the Generation of this Mucilage, he supposes that Nature has designed one large *Viscus*, and that this is the Office of the Spleen; the Glandules of which he makes to have two secretory Pores; by one of which some Acid, and by the other, some Austere Particles are separated; which meet-

ing in the small Cavities of the Glandules, they are converted into a Mucilaginous and Gummous Substance; he having observed, that Spirit of Vitriol mix'd with a Decoction of Galis, will produce a Gum.

After this, he gives an Account of Experiments made with the Mucilage; the most of which come to this, That all Acids do coagulate it, as all Austeres and Austere Acids; but with this Difference, that the *Coagulum* or Curd made by Acids only, is tenderer than that which is produced by an Austere only, or an Austere Acid.

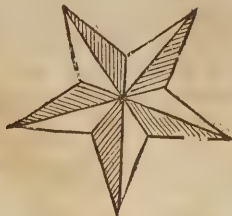
MUCRO Cordis, or *Apex*, is the lower pointed End of the Heart.

MUCRONATED, is whatever ends or terminates in a Point, like that of a Sword, &c.

MUCRONATUM Or: See *Ensisformis Car-tilago*.

MUFFLE, in Chymistry, is the Cover of a Test or Copper, which is put over it in the Fire.

MULLET, the Term in Heraldry for a Star of Five Points, of this Figure; and is usually the Difference or Distinguishing Mark for the Third Brother, or House.



Though 'tis often also born as Coat-Armour; as here:



Ruby on a Chief Pearl, Two Mullers Diamond; being the Coat of the Famous Lord Verulam, first Sir Francis Bacon. The Heralds say, the Mullet represents a Falling Star; 'tis rarely born of Six Points.

MULTA, or *Multura Episcopi*, was a Fine given to the King, that the Bishop might have Power to make his Last Will and Testament, and to have the Probate of other Mens, and the granting Administrations.

MULTANGULAR Figure, is one that has many Sides and Angles.

For its Superficial Content, see *Area*.

MULTILATERAL, in Geometry, are those Figures that have more than Four Sides.

MULTINOMIAL Root: See *Polynomial*.

MULTIPLE Proportion, is when the Antecedent being divided by the Consequent, the Quotient is more than Unity: And the Reason of the Name is, because the Consequent must be multiplied by the Index, or Exponent of the Ratio, to make it equal to the Antecedent. Thus 12 is multiple in proportion to 4, because, being divided by 4, the Quotient is 3, which is the Denominator of the Ratio: And the Consequent 4 being multiplied by 3, makes the Antecedent 12; wherefore 3 is *Sub-multiple* of 12.

MULTIPLE *Super-particular Proportion*, is when one Number or Quantity contains another more than once, and such an Aliquot Part more; of which see more under *Proportion*.

MULTIPLE *Super-partient Proportion*, is when one Number or Quantity contains another divers times, and some Parts thereof besides.

MULTIPLICATION, is, in general, the taking or repeating of one Number or Quantity as often as there are supposed Unites in the other. The Number *multiplied*, is called the *Multiplicand*; the Number *multiplying*, the *Multiplicator*; and that which is found or produced, is called the *Product*.

Multiplication is only a *Compendious Addition*, effecting at once what in the ordinary way of *Addition* would require many Operations: For the *Multiplicand* is only added to it self, or repeated, as often as the Unites of the *Multiplicator* do express. Thus if 6 were to be multiplied by 4, the *Product* is 24, which is the Sum arising from the *Addition* of 6 four times to it self.

In all *Multiplication*, as 1 is to the *Multiplicator*, so is the *Multiplicand* to the *Product*. Whence 'tis plain, that in *Multiplication* of *Integers*, the *Product* must be greater than either of the *Factors*, (for so the *Multiplicator* and *Multiplicand* are called, because between them they make up the *Product*) because either *Factor* is greater than *Unity*. But in *Multiplication* of *Fractions*, the *Product* must be less in Value than either of the *Factors*, because they are both less than *Unity*. Thus 24, the *Product* of 6, multiplied by 4, is greater than either 6 or 4; but $\frac{12}{5}$, the *Product* of $\frac{3}{5}$, multiplied by $\frac{2}{5}$, is less in Value than either $\frac{3}{5}$ or $\frac{2}{5}$.

MULTIPLICATION in Algebra or Species.

The General Rule is, To conjoin the Quantities propoed by the Sign (\times); which Sign, when the Quantities to be multiplied are express'd by but one or two Letters, is usually omitted, and the Quantities written down like Letters in a Word. Thus a multiplied by $b d$, may be written $a \times b d$, or, as is most usual, $a b d$.

And if the Signs $+$ or $-$, prefixed before the Quantities to be multiplied, are like, the *Product* is $+$; if unlike, the *Product* is $-$.

N. B. In Algebraic Multiplication, 'tis most commodious to begin to multiply at the Left-Hand, because we write that way.

Particular RULES.

I. RULE.

When two or more single Quantities, express'd by Letters, whether like or unlike, are to be multiplied into one another, and have no Numbers prefix'd; join the Quantities together, like Letters in a Word, and 'tis done:

$$\begin{array}{r} \text{Thus, } \begin{array}{c} d \\ f \end{array} \text{ and } \begin{array}{c} ab \\ dc \end{array} \text{ and } \begin{array}{c} mno \\ pqr \end{array} \\ \hline \text{Product} = \begin{array}{c} df \\ abdc \end{array} \begin{array}{c} mno \\ pqr \end{array} \end{array}$$

II. RULE.

If two Simple Quantities, whether like or unlike, are to be multiply'd, having Numbers or Coefficients prefixed before them; first multiply the Coefficients one into another, and to the *Product* annex the Letters of both Quantities; so this new Quantity is the *Product* sought.

Thus 3 a multiplied by 4 b , produces 12 ab .

III. RULE.

The *Multiplication* of Compound Quantities, depends on the preceding Rules: For every Member of the one, must be multiplied into every Member of the other; respect being had to the Signs, by the Caution given in the General Rule.

$$\text{Thus, } \begin{array}{c} a \quad d-c \\ g-b \quad +f \end{array}$$

$$ag + gd - gc - ba + bc - bd \times fa + fd - fc$$

IV. RULE.

Sometimes, when Compound Quantities are to be multiplied one by another, it is commodious to omit the Operation, and to set only the Word (*into*) or (\times) between them; having first drawn a Line over each Compound Quantity, to shew that every Member of the One is to be multiplied by every Member of the Other,

$$\text{Thus, To multiply } \begin{array}{c} aaa + 3aa - 2aa + 1 \\ \text{by } a \end{array} = 5a + 6,$$

$$\text{Write } aaa + 3aa - 2aa + 1 \times \text{ or into } aa - 5a + 6.$$

That in *Algebraic Multiplication* Like Signs give $+$, and Unlike $-$, in the *Product*, may be thus demonstratd:

1. Since *Multiplication* is the same thing as adding one *Factor* to it self, or repeating it so oft as there are Unites in the other:

2. Therefore, $+$ multiplying $+$, must produce $+$, since Positives added, will produce a Positive Sum.

3. A Positive multiplying a Negative, must produce a Negative: For 'tis only adding the Negative *Factor* to it self, or repeating it so often as there are Unites in the other. Now many Defects added, must still be Defects, or must have a Negative Sign, thus:

$$-6 \text{ multiplied by } +2, \text{ produces } -12.$$

4. Negatives multiplying Positives, must produce Negatives: For when the *Multiplicator* is defective, (there being really no Unites in it) it must work on the *Multiplicand* by Subtraction; therefore, in this Case, the *Multiplicand* must be subtracted (or made Negative) as often as there are Negative Unites in the *Multiplicator*: But to take away Positives, is to add Negatives; therefore the Defect of the *Multiplicand* is to be added or repeated as often as the Case requires; and if

it so, the Product must be Negative (by the last) thus :

+6 multiplied by — 2, gives — 12 in the Product.

5. *Negatives multiplying Negatives, must produce Positives* : For since Multiplication by a Negative, is the same as Subtraction ; and subtracting a Defect or Negative, the same as adding Positives, therefore 'tis clear, the Defect of the Multiplicand must be subtracted (that is, the Positive Multiplied added) so often as there are seeming Unites in the Multiplier ; which must needs produce Positive, thus :

— 6 into — 2, produces + 12.

MULTIPLICATION of Integers, in Common Arithmetick, is performed thus :

Suppose 365, the Days in a Year, were to be multiplied by 24, the Hours in a Natural Day ; write down the *Multiplicator* orderly under the *Multiplicand*, Unites being under Unites, Tens under Tens, &c. as you see here, and draw a Line under them. Then say, 365
4 times 5 is 20 ; I set down 0, and 24
carry two Tens to the next Rank ;
therefore 4 times 6 is 24, and 2 I carried is 26 : I set down 6, and carry 2 1460
(that is 200) to the next Rank. Then 730
I say, 4 times 3 is 12, and 2 I carried make 14 ; (i. e. 1400) which 14, because I have now done with the first Figure 4, I set down as you see. Then I begin with 2, the second Figure of the *Multiplicator*, which stands in the Place of Tens, and say, twice 5 is 10 ; I set down 0 under 6 (which is under 2, the Figure that I multiplied by, for that Rule must always be observed) and carry 1. Then twice 6 is 12, and 1 I carried is 13 ; I set down 3 on the Left-Hand of the last, and carry 1, as before. Lastly, I say, twice 3 is 6, and 1 I carried makes 7 ; which 7 I set down, as you see. Then adding the two Products, thus found, together, you will have 8760 for the true Product.

N. B. When there are Cyphers at the End of either Factor, or after both, multiply the significant Figures one into another, and to the Right Hand affix as many Cyphers as were in both ; v. gr.

$$\begin{array}{r} 466000 \\ 4000 \\ \hline 1164000000 \end{array}$$

When Cyphers are intermixed with the significant Figures of the *Multiplicator*, the Operation of them may commodiously be omitted, regard being had to the due placing the Figures of the Product, as you see in this

Example.

$$\begin{array}{r} 26845 \\ 3004 \\ \hline 107380 \\ 80535 \\ \hline 80642380 \end{array}$$

The Proof of Multiplication can only certainly be effected by Division, the Common Method by casting out the Nines, being false : For if you divide the Product by either Factor, the Quotient, if you have wrought truly, will be the other ; for Division destroys what Multiplication builds up. Thus,

If 8760 be divided by 365, it gives 24.

If divided by 24, it gives 365.

MULTIPLICATION in Geometry, or in Lines

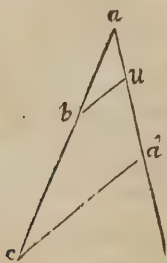
Is made by supposing a Right Line, as *a b* ; to be moved in a perpendicular Posture along another, as *b c* ; in which Case, the Line *a b* is

	a	1	2	3	4	5	6	7	d
1									
2				21					
3									

called the *Describent*, and *b c* the *Dirigent* : For by this means the *Describent* *a b*, will form the Rectangle *a d c b* ; and if it be divided, together with the *Dirigent*, into any Number of equal Parts, it will by its Motion describe as many little Rectangles, as the Unites in the *Describent* and *Dirigent* will produce, by being multiplied into one another, viz. 21. For when the Line *a b* hath moved over one part of *a d*, it will, by its 3 Parts, have described the 3 little Rectangles in the first Column ; when it comes to 2, it will have described 3 more, &c.

And this is the Reason why Multiplication, in the Latin Tongue, is usually expressed by the Word *Ducta* ; (and from hence also comes *Product*) as if *a b* were multiplied by *b c* ; they say *a b ducta in b c* ; because the *Describent* is led, as it were, or carried along in an erect Posture upon the *Dirigent*, and by that means describes the Rectangle : So that Rectangle and Product are all one in Geometry.

Since in all Multiplication, Unity is to one Factor, as the other is to the Product ; therefore Multiplication in Lines may be performed Geometrically thus :



Let ab be to be multiply'd by ad , make any Angle at pleasure, and then on one of the Legs set off $u =$ to Unity; and on the same Leg set off ud , the *Multiplicator* (3). Then set the *Multiplicand* ab (2) from a on the other Leg of the Angle; draw ub , and parallel to it, through d , draw dc . I say, dc , or 6, is the *Product*: For $au : ud :: ab : bc$.

MULTIPLICATION of *Decimal Fractions*. See *Decimal*.

MULTIPLICATION of *Fractions*. See in *Fractions*.

MULTIPLICATION of *Logarithms*. See *Logarithms*, N. 6.

MULTIPLICATION by *Logarithms*. See *Logarithms*, N. 8.

MULTIPlicAND, in Arithmetick, is the Number to be multiplied. See more in *Multiplication*.

MULTIPlicATOR, in Arithmetick, is the Number by which you multiply, or the Number multiplying.

MULTIPLIER, the same with *Multiplicator*.

A *MULTO fortiori*, or à *Minori ad majus*, is an Argument often used by *Littleton*, and is fram'd thus: If it be so in a Feoffment passing a New Right, much more is it for the Restitution of an Ancient Right, &c.

MUNIMENTS, among the Lawyers, are taken for such Authentick Deeds and Writings, as a Man can defend the Title to his Land or Estate by.

MURAGE, in Law, signifies a Toll or Tribute to be levied for building or repairing of Publick Walls; and is due either by Grant or Prescription. It seems also to be a Liberty granted to a Town by the King, for the Collecting Money towards the Walling of the same.

MURDER, according to our Law, is a Wilful and Felonious Killing of another upon premeditated Malice, whether secretly or openly, and whether *Englishman* or *Foreigner*, living under the King's Protection. And this premeditated Malice is Twofold:

1. *Express*, When it may be evidently proved that there was Ill-will; 2. *Implied*, When one killeth another suddenly, having nothing to defend himself, as going over a Stile, or such like: For in such a Case, or when a Man killeth a meer Stranger, the Law presumeth that he had Malice against him, or else he would not do it without any manner of Provocation.

MURDERERS, are small Pieces of Ordnance, either of Brass or Iron, having *Chambers* (that is, Charges made of Brass or Iron) put in at their Breeches: They are mostly used at Sea, at the Bulk-heads of the Fore-castle, Half-deck, or Steer-

age, in order to clear the Decks when an Enemy boards the Ship; they are fastned and traversed by a Pintle, which is put into a Stock.

MUSCLE, the chief Instrument of Voluntary Motion in an Animal Body. The Parts of a *Muscle* are Three; its *Head*, *Belly*, and *Tail*. The *Head* of a *Muscle* is its Beginning, and, as it were, the Centre of its Motion; and this is always fixed to the most stable Part. The *Belly* of a *Muscle* is its Middle Part, which is tumid, or extended, in all muscular Motion. The *Tail* is the other End or Extreme, which is fastned into the Part to be moved.

Muscular Motion, or which way the Belly of a *Muscle* comes to be swelled, and consequently its Extremes brought nearer together, in order to move the Part required, is a very great Mystery; as indeed many other Things are in an Human Body, which is fearfully and wonderfully made. There have been many *Hypotheses* to solve this, which whether satisfactory or not, must be left to every one's Judgment to determine.

Dr. *Willis* supposes the Animal Spirits, brought by the Nerves, to be lodged in the *Tendons* of the *Muscles*, and that meeting with other active Particles brought from the Blood, they make an *Efferescence*; by which the *Carnous Fibres* of the *Muscle* are agitated, stuffed and swelled, and so the whole *Muscle* is contracted in its Length.

Steno imagines the *carnous Fibres* of the *Muscles*, as also the opposite *Tendons*, to be in their Construction like to *Parallelograms*; by an Alteration of the Angles of which, the *Muscle* is contracted, and the *Head* and *Tail* brought near together: And this he thinks may be done without the Accession of any New Matter.

Dr. *Mayo* falls nearly in with Dr. *Willis* his Notion: He thinks the Contraction of the *Muscle* is made by an *Efferescence*, arising from the Mixture of the *Sulphurous Saline Particles* of the Blood, with the *Nitro-aerious* ones brought by the Nerves, which blow up and distend the Belly of the *Muscle*.

M. *Du Verney* fancies this Intumescence may be made without *Fermentation*, by the Animal Spirits, and a Juice from the Arteries, running into the *Tendons* and *carnous Fibres*, and so extending themselves, as Ropes and Cat-gut Strings swell in moist Weather.

Dr. *Croon* supposes every *carnous Fibre* to be made up of small Globules or Bladders, all opening one into another, into which the *nutritious Juice*, and one or two other fine and active Liquors, entering, do, by means of the natural Heat, make an Ebullition or *Efferescence*; by which means the whole Body of the *Muscle* becomes extended, and its Length contracted, &c.

Borelli takes the *Fibres* of a *Muscle* to consist of a Chain of divers *Rhombs* or *Lozenges*, whose *Areas* are capable of being enlarged or contracted, according as the nervous Juice, together with the *Lympha* and Blood, are let and forced into or out of them, *ad Imperium Animæ*.

The accurate Mr. *Cowper* seems to think the Blood to be the true *Pondus*, by which the Action of a *Muscle* is compounded; and that either by a Turgescence begun in the *Parietes* of the Cells of the *Fleshy Fibres*, caused by the Liquor contained in the Nerves, agitated *ad Imperium Animæ*; or by the Construction of the *Venous Ducts*, there be-

comes

comes a Repletion of their Cells, whereby the Length of the *Fibrilla* is contracted.

Dr. *Chirac*, Professor of Medicine at *Montpellier*, supposes, and thinks he can prove it analytically, That every Muscle being composed of a vast Multitude of Fibres, like Threads, folded up all together within one Skin or Membrane, and every Fibre having its proper Vein, Artery, and Nerve, it hath also from Space to Space several little Cavities or Pores which are of an oblong Form, when the Muscle is slack or flaccid; but the Blood circulating through the Muscle, is continually despoiling into those Pores a Sulphurous Recrement, abounding with *Alkali* Salts, which meeting with the Spirits that flow also by the Nerves into those oval Pores, their *Nitro-aerial* Particles ferment in a most violent manner with the Saline ones of this Sulphurous Recrement, and thereby distend the Pores so, as to make them change their long oval Figure into a round one; and thus the Muscle must be contracted.

MUSCLE Vein. This Vein is Two-fold, the *Superior* and the *Inferior*. The former arises from the Muscles of the Neck, and the latter from the upper Muscles of the Breast; and this sometimes opens into the External Jugular.

MUSCULUS Stapedis, is a Muscle of the Ear, which lies hid in a Bony Pipe, excavated in the *Os Petrosus*, almost at the bottom of the *Tympanum*, whence it takes its Origin. Its Belly is big and fleshy, and suddenly forming a very thin Tendon, which descends to its Insertion at the Head of the *Stapes*: When this acts, it draws the *Stapes* upwards, to the *Foramen Ovale*.

MUSCULUS Nauticus. See *Tibialis Posterior*.

MUSICK is one of the Seven Sciences, commonly called *Liberal*, and comprehended also among the *Mathematical*; as having for its Object *Discrete Quantity* or *Number*, but not considering it in the Abstract, like *Arithmetick*; but with relation to *Time* and *Sound*, in order to make a delightful Harmony.

This Science is also *Theoretical*, which examineth the Nature and Properties of *Concords* and *Discords*, explaining the Proportions between them by Numbers: And *Practical*, which teacheth not only Composition, that is to say, the manner of Composing all sorts of Tunes or Airs; but also the Art of singing with the Voice, or playing upon Musical Instruments. See Vol. 2.

MUSKET-Baskets, in Fortification, are Baskets of about a Foot and half high, and 8 or 10 Inches Diameter at the Bottom, and a full Foot at the top: They are filled with Earth, and are set on low Parapets or Breast-works, or on such as are beaten down, that the Musqueteers may fire between them at the Enemy, and yet be tolerably well secured against their Fire.

MUTE. (A Term in Law) A Prisoner is said to stand *Mute*, when he refuses to plead to an Indictment.

MUTULE, in Architecture, is a kind of Square *Modillon*, set under the Cornice of the *Doric* Order, and so called from the Word *Mutilus*, Maim'd, or Imperfect, because they represent the ends of the Rafters which are crooked or bent; in like manner, as the Beams, or Joists are represented by the *Triglyphs* in the *Frieze* of the same Order.

MYDRIASIS, is a too great Dilation of the *Pupil* of the Eye, which makes the Sight

Dim, because too much Light is then admitted into the Eye.

MYELOS, the Marrow of the Bones, or of the Brain, or Spinal Marrow.

MYGLOSSUM, is a pair of Muscles which arise about the backside of the Grinding Teeth, and are inserted into the Ligament of the Tongue, and are said to turn the Tongue upwards. *Blanchard*.

These from their Use, I suppose are the same which our Mr. *Cowper* calls *Styloglossus*, a Muscle, which arising sharp and fleshy from the *Processus Styloides*, descends obliquely forward, and is inserted to the Root of the Tongue immediately below the Implantation of the *Ceratoglossus*: This puts the Tongue inward, and turns it upwards.

MYLOHOIDEUS, is a Muscle which *Fallopian* makes double, but Mr. *Cowper* thinks it a single one, not being to be divided without great Violence: It possesses all that Space which is between the Lower Jaw, and the *Os Hyoides*; arising fleshy from both sides of the *Mandible* Internally, near the *Dentes Molares*; whence marching with a double Order of fleshy Fibres, the outwardmost of which pass directly to their Implantation in the *Os Hyoides*; and the middle run Transversely over the following Muscles, being inseparably joined to each other with a middle Line, as is well express'd by *Bidloo*, (Tab. 14.) Besides the Uses commonly ascribed to this Muscle in moving the *Os Hyoides*, Tongue, and *Larynx*, upwards, and forwards, and to either side; its last described Transverse Order of Fibres, have still a further use in Compressing the *Glandule Sublinguales*, which lie immediately under them on each side; whereby they hasten the Egress of the Spit, from the Inferior Salival Ducts in the Mouth. Hence it is we employ these Muscles (as in the Action of *Deglutition*) when we want *Saliva* to moisten the Mouth: And in that Action also they supply it with fresh *Saliva*, to join with those Aliments where Mastication is not required; which Artifice of Nature deserves our Admiration. *Cowper*.

MYLPHA, according to some, the falling off of the Hairs of the Eye-lids; and with others Medicines against the falling off of the Hair. *Blanchard*.

MYOCEPHALON, is the falling off of a small Portion of the *Tunica Uvea*, just begun, like the Head of a Fly; whence it has its Name. *Blanchard*.

MYODES Platysma, is a broad Muscous Expansion in the Neck, proceeding there from a sort of a fat Membrane. *Blanchard*.

MYOLOGIA is a Description of the Muscles of an Animal Body.

MYOPIA, *Purblindness*, is a certain Dimness or Confusion of Sight in distant Objects, and yet a Perspicacity in things near at hand: It is occasioned by the Globe of the Eye's being too Convex, so as to unite the Rays before they come to the *Retina*: Wherefore since the *Distinct Base* falls not on the *Retina*, but perhaps in the *Vitreous Humour*, the Vision in such an Eye cannot be distinct, unless of Objects very near. But all such Persons may be helped by *Concave Glasses*, or Spectacles.

MYRACH, an Arabian Word, signifying the same with *Epigastrium*.

MYRINX,

MYRINX, the same with *Tympanum*, or the Drum of the Ear.

MYRMECIA, is a sort of Wart; they are harder and lower than those fleshy Tumours called *Thymi*, take deeper Root, and occasion greater

Pain; broad below, and small at top, and emit less Blood. They are scarce ever bigger than a sort of Pulse called *Lupines*: They breed in the Palms of the Hand, or the Sole of the Foot. *Blanchard*.

N A A

NAAM in Common Law, signifies a Distress, or the taking another Man's Goods, and is either *Lawful*, or *Unlawful*; *Lawful Naam*, is a reasonable Distress, proportionable to the Value of the thing Distressed for.

NADIR, is that Point of the Heavens seemingly under the Earth, which is Diametrically opposite to the Point directly over our Head, viz. the *Zenith*; so that they are both as it were the Poles of the Horizon, and distant from it on each side 90 Degrees, and consequently fall upon the *Meridian*, one above, the other under the Earth; and whatever Distance one of them has from the Equator, and one of the Poles of the World; the same on the contrary, has the other from the opposite Pole, and adverse part of the Equator.

NAIANT, or *Natant*, (*i. e.* Swimming) is the proper Term in Heraldry, to Blazon *Fishes* in an Escutcheon, when they are drawn in an Horizontal Posture, *Fess-wise*, or Transversely across the Escutcheon; but if they are Erect, 'tis called *Hauriant*.

NAILING of Cannon, is the driving of a Nail, or Iron Spike, by force into the Touch-hole of a Piece of Artillery, so as to render it useless to the Enemy.

NAISSANT, *i. e.* *Nascent*, just new Born; the Herald's Term for a Lyon, or other Beast, appearing to be issuing or coming out of the middle of any *Fesse*, or other Ordinary; for if it come out from the lower Line of the Ordinary, they call it *Issuant*.

NAKED Fire, a Term used by the Chymists, for an open Fire, or one not pent or closed up.

NAPIER's Bones. See *Neper's*.

NARCOSIS, is a privation of Sense, as in a Palsie, &c. or in taking of *Opium*, &c. whence strong Opiate Medicines are frequently called.

NARCOTICKS, or Narcotick Medicines.

NASALIA, the same that *Erribina*.

NASCALIA, are little Globular Bodies which on some Occasions, are put into the Neck of the Matrix; they are made of the same Substance as the *Pessaria*. See *Pessaria*.

NASI *Os*, is a thin but solid Bone, which makes the upper part of the Nose; it's upper end is join'd to the *Os Frontis* by the *Sutura Transversalis*: One of its Sides joins its fellow, and its lower is joined to the *Os Maxillare*, upon its lower end the Cartilages of the Nostrils are fastened; externally it is smooth, but internally it is rough.

NATES *Cerebri*, are two round Prominences in the Brain, behind the Beds of the Optick Nerves, which grow to the upper part of the marrowy Substance; they are small in Men, and larger in Brutes.

NATTA, is a great soft Tumor, with Pain and

N A A

Colour, which grows most usually in the Back, but sometimes in the Shoulders; its Root is slender, yet it encreases so prodigiously, that it will grow as big as a Melon, or a Gourd; it is made of fat Matter, and therefore ought to be reckoned amongst the *Steatomata*. See *Steatomata*. *Blanchard*.

NATURE: This Word has usually these Significations.

First, and more strictly, it is taken for a peculiar Disposition of *Parts* in some particular *Body*; as we say, it is the *Nature of Fishes* to live in the *Water*.

Secondly, It is taken more largely for the Universal Disposition of all *Bodies*: And in this Sense 'tis nothing else, but the *Divine Providence*; so far as it governs and directs all things by certain *Rules* and *Laws*, accommodated to the *Natures* of things.

Thirdly, It is taken for the *Essence* of any thing, not *Corporal*, with the *Attributes* belonging to it: Thus we say, That it is the *Nature of God* to be *Good*, and the *Nature of the Soul* to *Think*.

NATURALIZATION, is when an *Alien* born Subject, is made the King's *Natural*; and this must be done by Act of Parliament. *Vide Denizons*.

NATURAL Day. See *Day*.

NATURAL Horizon, the same with *Sensible Horizon*. See *Horizon*.

NATURAL Quantity. See *Quantity*.

NATURAL Philosophy, is the same with what is usually call'd *Physicks*, viz. That Science which contemplates the Powers of Nature, the Properties of Natural Bodies, and their mutual Action one upon another.

NAVICULARE *Os*, called also *Cymbiforme*, is the third Bone in each Foot, in that Part of it which immediately succeeds the Leg.

NAVIGATION, is the Art of *Sailing*, whereby the Mariner is instructed how to guide a *Ship* from one Port to another, the shortest and safest way, and in the shortest Time: And this is twofold; either

Improper, Which is called *Coasting*, in which the Places are at no great distance one from another, and the Ship sails usually in sight of Land, and is within Soundings. Now for the Performance of this, there is required a good Knowledge of the Lands, the Use of the Compass, the Lead, or Sounding-Line, and such Books as *Rutters*, &c.

Navigation Proper, is where the Voyage is perform'd in the vast Ocean, out of sight of all Land; and here is necessary not only the Knowledge of the *Lead*, *Compass*, &c. but the Master must be a thro' Sailor or *Artist*, and understand well *Mercator's Charts*, *Azimuth* and *Amplitude Compass*, *Log-Line*,

Log-Line, and all good Instruments for *Celestial Observations* that can be used at *Sea*. And how to perform the several Parts and Cases of this Art, you will find under the Word *Plain*, and *Mercator's Sailing*.

NAUSEOUSNESS, or *Nausea*, Loathing, is an earnest Endeavour to Vomit, with Sickness and Uneasiness.

NAUTICAL Chart. See *Chart*.

NAUTICAL Compass. See *Compass*.

NAUTICAL Planisphere, is a Description of the Terrestrial Globe upon a Plane, for the Use of Mariners; and is either,

1. The *Plane Chart*, as they call it, where the *Parallels of Latitude* are all of the same Length with the *Meridians*; and which therefore is very erroneous, except in short Voyages, and near the Equator: Or,

2. *Wright's*, commonly called *Mercator's Chart*, where the *Meridians* are increased in Proportion, as the *Parallels* shorten: That is, as the Secants of the Arks contained between the Point of Latitude, and the Equator.

NE Admittas, is a Writ directed to the Bishop, at the Suit of one who is Patron of any Church, and he doubts that the Bishop will Collate one his Clerk, or admit another Clerk presented by another Man to the same Benefice: Then he that doubts it, shall have this Writ, to forbid the Bishop to Collate or Admit any to that Church.

NEBULOSE, a Term in Heraldry, when the out-Line of any Bordure, Ordinary, &c. is of this Form, *i. e.* resembling something of the Figure of Clouds.



NEBULOUS Stars, are certain fixed Stars of a dull, pale, and obscure Light.

NECROSIS, is a black and blue Mark in any part of the Body.

NEEDLE. See *Box and Needle*.

NEGATIVE Pregnant, is when an Action, Information, or such like, is brought against one, and the Defendant Pleads in Bar of the Action; or otherwise a *Negative Plea*, which is not so special an Answer to the Action, but that it includes also an Affirmative: As if a Man being impleaded to have done a thing on such a Day, or in such a Place, denieth that he did it *Modo & forma declamata*; which implieth nevertheless, That in some sort he did it: Or, if a Man be said to have alienated Land in Fee, and he saith, he hath not alienated in Fee, this is *Negative Pregnant*; for tho' it be true, that he hath not alienated in Fee, yet it may be, he hath made an Estate in Tail.

NEGATIVE Quantities in Algebra, are such as have before them the

NEGATIVE Sign —, and which are supposed to be less than nothing. These are directly contrary to Positive, Affirmative, or Real Quantities.

NE injuste vexes, is a Writ which lies for a Tenant that is Distrained by his Lord for other Services than he ought to make, and is a Prohibition to the Lord in it self, commanding him not to Distrain.

NEIPE TIDES, written also *Nepe* or *Neep*, are those Tides (when the Moon is in the middle of the second and last Quarter) which are opposite to the *Spring-Tides*; and as the highest of the *Spring-Tides* is three Days after the Full or Change, so the lowest of the *Neep* is four Days before the Full or Change; and then the Seamen say, that it is *Deep Neep*: Also when a Ship wants Water, so that she cannot get out of a Harbour, off from the Ground, or out of the Dock, the Seamen say she is *Neiped*.

NEOMENIUM, signifies only the *New Moon*, or *Change*.

NEPER's Bones, or *Rods*, are a kind of larger Multiplication Table, contrived by that Excellent Mathematician my Lord Neper, Baron of *Merchiston* in *Scotland*, for the more easie multiplying, dividing, and extracting of Roots out of great Numbers.

Their Fabrick is very easie, as well as their Use: Both which follow.

The *Rods* are best made of Wood or Ivory, four Square, having all the Digits on them, and their Multiplication to 9; being only *Pythagoras's Table* cut into pieces; they have an Index prefixed, shewing the Value of the Multiples to 9. The Complement *viz.* Remainder to 9, is on the back-side of each Bone, the other Sides being disposed in the most convenient form, the Figures represented being set on the Ends: But they are so common, and so well known, that there needs no further Description of them.

The INDEX.

1	6	1	2	3	6123
2	12	2	4	6	12246
3	18	3	6	9	18369
4	24	4	8	12	24492
5	30	5	10	15	30615
6	36	6	12	18	36738
7	42	7	14	21	42861
8	48	8	16	24	48984
9	54	9	18	27	55107

Having any given Number to Tabulate, or to be laid down by the Rods: As suppose 6123.

From your Set of Rods, take as many of them as you have Numbers in your Figures, as here 4 Rods, having at the top of them the given Figures, which set in their respective Order as above; and the Product of the whole given Number into any of the Digits, you have right against that Digit, as the Index directs; taking the Sum of every Diagonal Square; and setting them down from the Right to the Left.

To Multiply by the Rods.

A Single ROD.



Set your Multiplicand down, or Tabulate it on the Rods, and take every several Product answering the Figures of your Multiplier; which, all added together, gives the Product: As if 6123 was to be multiplied by 356, having Tabulated the Multiplicand, (as you see above) the several Products thereof into each Figure of the Multiplier, you are directed to by the Index: Which being added together, (respect being had to the due placing, their Sum) is 2179788, which is the Product of 6123 by 356.

$$\begin{array}{r}
 6123 \\
 356 \\
 \hline
 36738 \\
 30615 \\
 18369 \\
 \hline
 2179788
 \end{array}$$

Division by Neper's Bones.

Tabulate your Divisor, then you have it multiplied by all the Digits; out of which you may choose such convenient Divisors as will be next less to the Figures in the Dividend, and subscribe the Index answering in the Quotient; and so continually, till the Work is done. Thus 2179788, divided by 6123, gives in the Quotient 356.

Having Tabulated the Divisor 6123, then I see that 6123 cannot be had in 2179; therefore I take five Places, and on the Rods find a Number that is equal or next less to 21797, which is 18369, that is three times the Divisor: I set 3 in the Quotient, and subtract 18369 from the Figures above, there rests 3428; to which I add 8, the next Figure of the Dividend, and seek again on the Rods for it, or the next less, which I find to be 5 times; I set 5 in the Quotient, and subtract 30615 from 34288, rests 3673; to which I add 8, the last Figure in the Dividend, and finding it to be 6 times the Divisor, set 6 in the Quotient.

$$\begin{array}{r}
 6123 \) \ 2179788 \ (\ 356 \\
 \underline{18369} \\
 34288 \\
 \underline{30615} \\
 36738 \\
 \underline{36738} \\
 00000
 \end{array}$$

Of the Extraction of Roots by the Rods.

For the Easie and Expeditious Performance of which, there are two Rods on Purpose; one for the Square, and another for the Cube.

To Extract the Square Root.

As, suppose that of 571536.

First, Point each other Figure, beginning with the last.

$$\begin{array}{r}
 571536 \ (\ 756 \\
 \underline{49} \\
 145 815 \\
 \underline{725} \\
 1506 9036 \\
 \underline{9036} \\
 0000
 \end{array}$$

2. Take the Rod, called the Square Rod, and set it to the Index, and seek for the Figures of the first Prick (57,) finding 49 the nearest, set 7 in the Quotient, and subtract 49 from 57, there rests 8.

3. To the Remainder (8) add the next two Figures to the next Prick (15) makes 815.

4. Double the Quotient 7, viz. 14, which Tabulate between the Index and the Square Rod each time after the Work; seek then upon the Rods for the next less or equal Number to the Figures 815, which I find to be 725, that is five times; set 5 in the Quotient, and after the Divisor; then multiply and subtract, and to the Remainder add the two Places to the next Point 36.

5. Double the Quotient 75, which is 150; this set betwixt the Index and the Square Rod, and work as before, you'll find the Root to be 756.

If your Root be not perfect, but something remains after the last Subtraction, add a Cypher to the Square, and proceed.

To Extract the Cube Root by the Rods.

$$\begin{array}{r}
 91733851 \ (451 \\
 \underline{64} \\
 48 27733 \\
 \underline{24125} \\
 300 \\
 6075 608851 \\
 \underline{607501} \\
 135 \\
 608851
 \end{array}$$

1. Point every third Figure from the last, set the Cube Rod to the Index; seek the next less Cube on the Rod, which in the foregoing Example is 64; that is 4 times; set 4 in the Quote, and subtract, rest 27; to which add the three Figures to the next Point, the Sum is 27733.

2. Square the Figure found in the Quotient, and triple that Square, (and this must be done each time for a Divisor) which set betwixt the Index and the Cube Rod: Thus here the 4 in the Quote, squar'd, gives 16; then tripl'd is 48, which set between the Index and the Cube Rod for a Divisor.

3. Seek a Quotient (5) which set down, and the Number answering 24125 place as in the Example; but before you subtract, you must triple the Quote 4, which is 12, and multiply it by the Square of the last Figure 5. viz. 25; now 25 by 12 = 300, which place under 24125, one place forward to the Left Hand, and subtract, there rests 608. This Work must be repeated for each Figure in the Quotient, viz. to 608 and 851 for a Resolvend; square 45, and triple that Square, it gives 6075 for a new Divisor, which placed next before the Cube Rod, shews it will be but 1 for the Quotient, which answers to 607501, which set down; and tripling 45, and multiplying it by 1, makes 135: This set one short, their Sum will be 608851; so that after Subtraction nothing remains. But if there remains any thing, add three Cyphers to it, for every Decimal Place you would have in the Root, and proceed as before.

NEPHELÆ, are small White Spots upon the Eyes; also little Clouds, as it were, that swim in the middle of the Urine; likewise little white Spots in the Surface of the Nails like little Clouds.

NEPHRITICKS, are Medicines against the Diseases of the Reins.

NEPHRITIS, is a Pain in the Reins, proceeding either from an ill Disposition, or an Inflammation; or from the Stone and Gravel, accompanied with Vomiting and Stretching of the Thigh. *Blanchard.*

NEPHROS, is a Kidney, one on each side of the Abdomen, placed about the Loins under the Liver and Spleen; it is shaped like a Kidney-Bean: Its Substance is made up of a great Company of little Pipes. On both sides it receives the Serum from the Glandules which border upon the Arteries, and carries it to the little Bodies in the Reins called *Caruncula Papillares*, (which see) that so it may be discharged by the *Pelvis*, the *Ureters*, the *Bladder*, &c. See *Renes*.

NERVE, is an Organical Similar Part of an Human Body, being also of a fibrous round, long, white porous Substance, and whose Use is to convey the Animal Spirits so, as to make the Parts of the Body moveable and sensible.

The Nerves are supposed to contain a Three-fold Substance; the Innermost of which is white and medullary, and is thought to proceed from the *Medulla Cerebri*; the other two are supposed to arise from the *Meninges* of the Brain: Of which the middle and softer comes from the *Pia mater*, and the outer and harder from the *Dura mater*.

All the Nerves take their Rise from the *Medulla oblongata cerebri*, either within the Skull, or from its Continuation, when it becomes the *Medulla spinalis*. *Diemerbroeck* reckons 39 Pairs or Conjugations of Nerves, besides the *Nervous sine pari*; and he reckons that Nine Pair of these arise within the Skull, and the other 30 he saith come from the *Medulla spinalis*, through the Perforations of the *Vertebrae*; which he subdivides into the Eight *Cervical Pairs*, the Twelve *Thoracical*, the Five that come from the Region of the Loins, and the other Five which come from the *Os sacrum*; to which the *Nervous sine pari* is to be added, which arises from the End of the Spinal Marrow, and which some have taken for a kind of Ligament.

The Nerves do ordinarily accompany the Arteries thro' all the Body, that by the Pulse of the Arteries, the Animal Spirits may be kept warm and moving.

The Nerves have also Blood-Vessels attending them, which are spread usually on their Coats; and do also sometimes run in among the Medullary Fibres, as may be seen in those of the *Retina*.

Where-ever a Nerve sends out a Branch, or receives one from another, there is commonly a *Ganglio* or *Plexus*, as you may see at the Origin of all the Nerves in the *Medulla spinalis*, and in many Places of the Body.

NERVUS, in Botanicks, signifies a long Filament or rigid String, which runs a-cro's or length ways in the Leaf of a Plant. And thus, because there are Five such Nerves or Filaments running long ways in the Leaves of one kind of *Plantane*, that Plant hath been called *Quinque nerva*.

NETTINGS, in a Ship, are a sort of Grate made with small Ropes, and seized together with Rope-yarn; and are laid in the Waist of a Ship sometimes, to serve instead of *Gratings*.

NEURODES, is a sort of lingering Fever, so called by the Learned Dr. *Willis*; because that the Nervous Juice, departing from its own right and natural Crasis, becomes the Occasion of an Atrophy.

NEUROLOGY, is an accurate Description of, or Discourse on, the Nerves of an Human Body.

NEUROTICKS, are Remedies against the Diseases of the Nerves.

NEUROTOMY, is an Anatomical Section of the Nerves, for the Benefit of the Patient; and sometimes also a pricking of the Nerves by unskillful Bleeding, &c.

NEUTRAL. Mr. *Boyle* calls some kind of Spirits which he could distil from Tartar, and some ponderous Woods, by this Name of *Neutral Spirits*, as also *Adiaphorous* and *Anonymous*; because he found them very different in Quality and Nature from either the *Acid*, *Vinous*, or *Urinous* Spirits. For the Way of making it, see *Adiaphorous*.

NICHE, in Architecture, is a Cavity left designedly in the Wall of a Building, to place a Statue in.

NICTITANS *Membrana*, is a thin Purplish or Reddish Membrane or Film, which several Beasts and Birds have to cover or shield their Eyes from Dust, &c. they can draw it over their Eyes at pleasure, and 'tis so very much thinner

than the Eye-lid, that they can see pretty well thro' it.

NIENT *comprise*, is an Exception taken to a Petition, as unjust, because the thing desired is not contained in that Act or Deed, whereon the Petition is grounded. For Example, One desireth of the Court to be put into Possession of a Houfe, formerly amongst other Lands, &c. adjudged unto him : The adverse Party pleadeth, That this Petition is not to be granted, because tho' he had a Judgment for certain Lands and Houfes, yet the Houfe, into the Possession whereof he desireth to be put, is not contained amongst those for which he had Judgment.

NIHL, or *Nicbil*, is a Word which the Sheriff answers, that is opposed concerning Debts illeivable, and that are nothing worth, by reason of the insufficiency of the Parties from whom they are due.

NIHIL dicit, is a failing to put in Answer to the Plea of the Plaintiff by the Day assigned, which if a Man omit, Judgment passeth against him of Course by *Nihil dicit* ; that is, because he says nothing in his own Defence, why it should not.

Nihil capiat per Breve, is the Judgment given against the Plaintiff, either in Bar of his Action, or in Abatement of his Writ.

Nihil capiat per Billam, the same with *Nihil capiat per Breve*.

NIPPERS, are small Ropes in a Ship about a Fathom or two long, with a little Truck at one End, and sometimes only a Wale-knot ; their Use is to help hold off the Cable from the Main or Jeer Capstan, when the Cable is so slimy, so wet, or so great, that they cannot strain it to hold it off with their bare Hands.

NISI Prius, is a Writ Judicial, which lieth in Case, where the Jury is Impannell'd, and return'd before the Justices, the one Party or the other requesting to have this Writ for the ease of the Country, whereby the Sheriff is willed to cause the Inquest to come before the Justices in the same County at their coming ; and it is called a Writ of the *Nisi prius*, of these two Words, whereby the Sheriff is commanded to bring to *Westminster* the Men Impannell'd at a certain Day, or before the Justices of the next Assizes, *Nisi die Luna apud talem locum prius venerint*, &c.

NITRE, the same with Salt Petre. Some are mighty fond of the Notion of a *Volatile Nitre*, which abounds in the Air ; and they attribute abundance of *Phænomena* to the Operation of the Nitrous Particles in the Air.

That the Air abounds with Saline Particles, is most certain ; for being filled continually with *Effluvia* from the Earth and Sea, it must needs have from both a great Quantity of Saline Corpuscles ; and these will be of different Kinds according to the Variety of those Salts from whence they are derived. But why these should be mostly supposed of a *Nitrous Nature*, is not so easie to prove ; for Salt Petre is by no means found in a greater Quantity than the other Salts (especially common Salt ; nor is it of a much more Volatile Nature than they, nor capable of being raised more easily, or by a lesser heat. But since Soot, and that which produces it, Smoak, is found to abound very much with a truly Volatile Salt ; and since such a kind of Salt is produced frequently by the Putrefaction of Animal

and Vegetable Bodies, there is good reason to suppose the Air may abound with Salts of this kind : As also with many decomposed ones, of very different Kinds and Natures, and to which no proper name can well be assigned ; and therefore they have been called *Anonymous*, by Mr. Boyle, and many others.

NOCTAMBULO, or *Noctambulus*, is one who walks in his Sleep.

NOCTURNAL, is an Instrument made of Box, Ivory or Brass, divided on both sides, to take the Altitude or Depression of the Pole-Star, in respect to the Pole it self, in order to find the Latitude and nearly the Hour of the Night.

NOCTURNAL Ark, is that Space in the Heavens which the Sun, Moon, or Stars, run thro' from their Rising to their Setting.

NOCTURNLABE, is an Instrument used to find how much the *North Star* is higher or lower than the Pole at all Hours of the Night.

NOCTILUCA, is one of the two kinds of *Phosphorus* ; the former of which, such as the *Bolanian Stone*, *Hermetick Phosphorus Balduini*, &c. will not shine, except first exposed to the Sun-beams, but this kind of *Noctiluca*, is a self-shining Substance, which requires the being exposed to no Light to render it Luminous : As the *Phosphorus* made of Urine, &c. which see in *Phosphorus*.

Mr. Boyle in his Book of the *Aerial Noctiluca*, reckons three of these *Noctiluce*.

1. The *Gummos*, Consistent or Constant one, (as some *Germans* call it) which is in the Form of a Consistent Body.

2. The *Liquid Noctiluca*, which probably is only the former dissolved in a proper Liquor.

The *Aerial Noctiluca*, because it would immediately begin to shine, on being exposed to the open Air. See the Process for this last, P. 105, of the afore-mentioned Book, which being much the same with that of the *Phosphorus*, commonly made out of Humane Urine, I have omitted. See *Phosphorus*.

NODES, in *Astronomy*, signifie the Points of Intersection of the Orbit of the Sun, or any Planet, with the Ecliptick, so that the Point where a Planet passes over the Ecliptick, out of Southern into Northern Latitude, is called the North Node : And where it descends from North to South, 'tis the South Node ; which *Nodes* (according to some) change their Places in the Zodiac, like the Planets : But Sir *Is. Newton* proves *Prop. 14. Lib. 3.* that the *Nodes* of all the Planets Orbits (as well as their *Apselias*) are at Rest.

NODULUS, *Nodus*, is a Bag of such suitable Ingredients as the Disease requires, put into Beer or Wine, the Tincture whereof the Patient is to drink.

NODUS or *Node*, in *Dialing*, in a certain Point in the Axis or Cock of the *Dial*, by the Shadow of which, either the Hour of the Day in Dials without Furniture, or the *Parallels of the Sun's Declination*, its Place in the Ecliptick, the *Italian* or *Babylonish Hours*, &c. are shown, in such Dials as have Furniture.

'Tis an easie thing, and sometimes of good Use, to make Dials which shall shew the Hour of the Day by an Hole or

NODUS.

NODUS. One Method of which; *Mr. Collins* at the End of his Sector on a Quadrant, gives as follows.

First, Draw an Horizontal Dial for the Latitude proposed: Then by the Help of the Sun's Azimuth (which may be found by a Quadrant) or by knowing the Hour of the Day by that Horizontal Dial, draw a true Meridian from the Hole or *Nodus* proposed, both above in the Ceiling, and below on the Walls and Floor of the Room; so that if a Right Line were extended from the said Hole or *Nodus* to any Point in any of those Lines, it would be in the Meridian Circle of the World.

Next, Fix the End of a Thread in the Centre of the Hole or *Nodus*, and move the other End thereof up or down in the said Meridian drawn on the Ceiling or Wall, until by applying the side of a Quadrant to that Thread, it is found to be elevated equal to the Latitude of the Place, then that Thread is directly situated parallel to the Axis of the World, and the Point where the End of that Thread toucheth the Meridian either on the Ceiling or Wall, is that Point in the direct Axis sought for; wherein fix one End of the Thread, which Thread will be of present Use in projecting the Hour-Points in any place proposed.

Then place the Centre of the Horizontal Dial in the Centre of the Hole or *Nodus*, and situate it exactly parallel to the Horizon, and its Meridian in the Meridian of the World, (which may easily be done, if at the Instant you know the true Hour of the Day) then take the Thread, whose End is fixed in a Point in the direct Axis, and move it to and fro, until the Thread doth interpose between your Eye, and the Hour Line on the Horizontal Dial, and keeping your Eye in that Position, make a Point or Mark where you please, so that the Thread may interpose between that Point and your Eye; which Point so found, will shew the true Time of the Day at that Hour all the Year long, the Sun shining thereon, so will the Point and the said Thread serve to shew the Hour instead of an Hour-Line.

In like manner, the Thread fixed in the Axis, may be again moved to and fro, until the Thread doth interpose between the Eye and any other Hour-Line desired on the Horizontal Dial, and then (as before) make another Point or Mark in any Place at pleasure, by projecting a Point from the Eye, so that the Thread interpose between that Point to be made, and the Eye, so will that Point so found shew the true Time of the Day for the same Hour that the Hour-Line did on the Horizontal-Dial, which was shadow'd by the Thread.

Thus you may proceed (by the help of that Thread and the several Hour-Lines on the Horizontal Dial) to find the other Hour-Points, which must have the same Numbers set to them, as the Hour-Lines on the Horizontal Dial have.

Otherwise, to make a Dial from a Hole in any Pane of Glafs in the Window, and to graduate the Hour-Lines on the Ceiling, Floor, &c. that Hole is supposed to be the Centre of the Horizontal Dial, and being true placed, the Stile thereof, if supposed continued, will run into the Point in the Meridian of the Ceiling before found, where a Thread is to be fixed; then let one extend a Thread fast-

ened in the Centre of the Horizontal Dial, parallel to the Horizon over each respective Hour-Line; and holding it steady, let another extend the Thread fastned in the Meridian in the Ceiling, along by the Edges of the Horizontal Thread, which will find divers Points on the Ground, thro' which, if Hour-Lines be drawn, the Sun shining thro' the Hole in the Pane of Glafs, will shew the Time of the Day.

For the Points that will be thus found on the Beam or Transome, the Thread fixed in the Ceiling, or instead of it a piece of Tape there fixed must be moved to up and down, that the Spot of the Sun may shine upon it; and being extended to the Transome or Beam, graduated with the Hour-Lines, it there shews the Time of the Day.

Note, That 'twill be convenient to have that Pane of Glafs darkned, through which that Spot is to shine;

In like manner may a Dial be made from a Nail-head, a Knot in a String tied any where across, or from any Pin driven into the Bar of the Window; and the Hour-Lines graduated upon the Transome or Board underneath.

To make a Reflected Dial on the Ceiling of the Room, is only the contrary of this, by supposing the Horizontal Dial, with its Stile, to be turned downwards, and run into the true Meridian on the Ground, where the Thread is to be fixed, and to be extended along the former Horizontal Thread (held over the respective Hours) upward, to find divers Points in the Ceiling.

NOLI me tangere, is a sort of Canker in the Face, especially above the Chin; there arises a Tumour or Ulcer about the Mouth and Nose; like an exulcerated Canker, which grows slowly at the beginning, like a little Pimple; it remains a whole Year, otherwise is less troublesome than a Canker, which gnaws and eats more in one Day, than a *Noli me tangere*, doth in a Month.

NOMBRILO or Navel-Point in an Escutcheon: See the Word *Escutcheon*.

NOME, are deep and putrid Ulcers in the Mouth. *Blanchard.*

NOME, in *Algebra*, is any Quantity with a Sign prefixed to it, and by which 'tis usually connected with some other Quantity; and then the whole is called a *Binomial*, or *Trinomial*, &c. Thus $a + b$ is called a *Binomial*, whose Names are a and b ; and $a + b + c$ is a *Trinomial*, whose Names are a , b , and c , &c.

NON-ABILITY, in Law is an Exception taken against the Plaintiff or Defendant, upon some Cause why he cannot commence Suit in Law, as *Premunure*, *Outlawry*, *Protest in Religion*, *Excommunication*; or a *Stranger born*, which last holds only in Actions real and mix'd, and not in Personal, except he be a Stranger and an Enemy. The *Civilians* say, That such a Man hath not *Personam standi in judicio*.

NON admittas. See *Ne admittas*.

NONAGE, a Term in Law, signifying all that Time of a Man's Age, under One and twenty Years in some Cases, and Fourteen in others, as Marriage.

NONAGESIMAL Degree, is the highest Point, or 90th Degree of the Meridian.

NON-

NON-CLAIM, a Term in Law, signifying the Omission or Neglect, of him that ought to challenge his Right within a time limited, by which Neglect he is either barr'd of his Right, as at this Day upon *Non-claim* within five Years after a Fine, and Right to him accrued; or of his Entry by his Descent, for want of *Claim*, within five Years after the *Disseisin*.

NON compos mentis; That is, not of sound Memory or Understanding; of such in Common Law they reckon:

First, An Idiot Born.

Secondly, He that by Accident wholly loseth his Memory and Understanding.

Thirdly, A Lunatick, that hath *Lucida intervalla*; sometimes has Understanding, and sometimes not.

4. He that by his own Act for a Time depriveth himself of his right Senses, as a Drunkard; but this last kind shall give no Privilege to him or his Heirs.

NON distringendo, is a Writ comprising under it divers Particulars, according to divers Cases. See Tab. of Orig. Reg. Verb. *non distringendo*.

NONES of a Month, are the next Days after the Kalends, which is the first Day. In March, May, June and October, the Romans accounted six Days of the Nones, but in all the rest of the Months but four. They had this Name probably because they were always 9 Days inclusively, from the first of the Nones to the Ides; i. e. reckoning inclusively both those Days.

NON est Culpabilis, in Law, signifies the general Plea to an Action of Trespas, whereby the Defendant doth absolutely deny the Fact imputed to him by the Plaintiff; whereas in other Special Cases the Defendant but alledgeth some reason in his own Defence.

NON est factum, is an Answer to a Declaration, whereby a Man denieth that to be his Deed; whereupon he is Impleaded.

NON Implacitando aliquem de libero tenemento sine brevi, is a Writ to inhibit Bayliffs, &c. from distraining any Man without the King's Writ, touching his Free-hold.

NON Intromittendo, quando breve de Præcipe in Capite subdole impetratur, is a Writ directed to the Justices of the Bench, or in Eyre, willing them not to give one that hath, under colour of Intirling the King to Land, &c. as holding of him *in Capite*, deceitfully obtained the Writ called *Præcipe in Capite*, but to put him to his Writ of Right, if he think good to use it.

NON Mercandizanda Viſualia, is a Writ directed to the Justices of Assize, commanding them to enquire, Whether the Officers of such Towns do sell Viſuals in Groſs, or by Retail, during their Office, contrary to the Statute, and to punish them if they find it true.

NON Moleſtando, is a Writ that lieth for him which is Molested, contrary to the King's Protection granted him.

NON-Natural Things, or the *Non-Natural Causes of Diseases*, as the Physicians reckon them are fix, viz. The Air, Meat and Drink, Sleep and want of Sleep, the Morions and Repose of the Body, the Retention, or Evacuation of the Excrements and Recrements of it, and the Passions of the Mind.

NON-Organical Part of an Animal, is that

whereeto some Use is only appropriated, but no Action, as a Gristle, Bone, Foot, &c.

NON Obſtante, is a Clause frequent in Statutes and Letters Patent; it signifies *Notwithstanding*, and was first brought in by the Pope, and in the Reign of Hen. 3. was used by that King in his Grants, &c.

NON omitt. propt. aliquam libertat. is a Writ that lies where the Sheriff returns upon a Writ to him directed, that he hath sent to the Bayliff of such a Franchise which hath the return of Writs, and he hath not served the Writ, then the Plaintiff shall have this Writ directed to the Sheriff to enter into the Franchise, and execute the King's Process himself. Also the Sheriff shall warn the Bayliff, That he be before the Justices at the Day mentioned in the Writ, and if he come not, then all the *Judicial Writs*, during the same Plea, issuing, shall be Writs of *Non Omittas*, and the Sheriff shall execute the same.

NON Ponendis in Affis & Furatis, is a Writ founded upon the Statute of West. 2 cap. 38. and *Articuli super Chartas*, cap. 9. which is granted upon divers Causes to Men, for the freeing them from *Affizes* and *Furors*.

NON Procedendo ad Affsam Rege inconsulto, is a Writ to stop the Trial of a Cause appertaining unto one that is in the King's Service, &c. until the King's Pleasure be further known.

NON Residentia pro Clericis Regis, is a Writ directed to the Ordinary, charging him not to molest a Clerk employed in the King's Service, by reason of his *Non-Residence*.

NON-Residence, in Law, is applied to such Spiritual Persons as are not Resident on, but do absent themselves for the space of a Month or two; at several times in one Year from their Benefices, for *Personal Residence* is required of Ecclesiastical Persons upon their Cures.

NON Sane Memory, in Law, is an Exception taken to an Act declared by the Plaintiff or Demandant, to be done by another, whereupon he grounds his Plea or Demands: And the Effect of it is, That the Party that did that Act was mad, or not well in his Wits when he did it. See *Non compos mentis*.

NON Solvendo Pecuniam ad quam Clericus multatur pro non Residentia, is a Writ prohibiting an Ordinary to take a Pecuniary Mulct imposed upon a Clerk of the King, for *Non-Residence*.

NON-Suit, in Law, is Renouncing of the Suit by the Plaintiff or Demandant, most commonly upon the Discovery of some Error or Defect, when the Matter is so far proceeded in, as that the Jury is ready at the Bar to deliver their Verdict. The *Civilians* term it; *Litis renunciationem*. And in what Cases a Man cannot be *Non-Suit*. See the Statute of 2 H. 4. cap. 7.

NON Sum Informatus. See *Informatus non Sum*.

NON Tenure, in Law, is an Exception to a Count, by saying, That he holdeth not the Land specified in the Count, or at least some part of: And 'tis either *Non tenure General*, or *Non tenure Special*: The *Special Tenure*, is an Exception, alledging that he was not Tenant the Day when the Writ was purchased. *Non tenure General*, is when one denies himself ever to have been Tenant to the Land in Question.

NORMAL, the same with Perpendicular, or at Right Angles, and 'tis usually spoken of a Line or a Plane that Intersects another Perpendicularly.

NORTHERN Signs of the Ecliptick or Zodiac, are those Six which constitute that Semi-circle of the Ecliptick which inclines to the Northward from the Equator, as *Aries, Taurus, Gemini, Cancer, Leo, Virgo*.

NOSOCOMIUM, is an Hospital for Poor Sick People, where they are attended, and cured, if possible.

NOTES in Musick, are certain Terms invented to distinguish the Degrees of Sound in Tuning, and the Proportion of Time thereto belonging: For in regard that a Voice doth express a found best, when it pronounceth some Syllable or Word with it, six select Syllables were formerly used to that Purpose, ascending and descending in order, viz. *Ut, Re, Mi, Fa, Sol, La*; but four of them, viz. *Mi, Fa, Sol, La*, being found sufficient for the right Tuning of all the Degrees or Sound, and less burthenome to the Memory, the other two, *Ut* and *Re*, are generally now laid aside as superfluous. It is reported, That *Guido Aretinus*, having undertaken to reduce the Greek Scale of Musick to a more regular form about A. D. 960, assumed for the Names of these six Notes as many Syllables taken out of the *Sapphick Hymn* of *St. John Baptist*, which began thus:

*Ut queant Laxis RESonare fibris,
MIRA Gestorum FAMuli tuorum,
SOLve polluti LABii reatum.*

As for other sort of Notes relating to Time, they are Nine in Number, viz. *Large, Long, Breve, Semi-breve, Minim, Crotchet, Quaver, Semi-quaver, and Demi-semi-quaver*. The four first are usually termed *Notes of Augmentation, or Increase*, and the five last of *Diminution or Decrease*. The *Semi-breve* being the last of Augmentation, is commonly called the *Master-Note, or Measure-Note, or Time-Note*, because it is of a certain determinate Measure or Length of Time by it self; and all the other Notes both of *Augmentation* and *Diminution*, are measured by, or adjusted to its value: But it ought to be observed, that the *Large* and *Long* are now of little use, as being too long for any Voice or Instrument (the Organ only excepted) to hold out to their full length; altho' their *Rests* are still very often used, more especially in Grave Musick, and Songs of many Parts.

NOTHE costæ, are the five lowest Ribs on each side, called Bastard Ribs; so named, because they do not join with the Breast-bone as the other Ribs do, nor are they as the others, Boney, but Cartilaginous.

Diseases are likewise called *Nothi*, or Bastard, when they agree not with the Ordinary and Common Rules, as *Tertian, Quartan, and Quotidian, Bastard Agues, Bastard Pleurisies, &c.*

NOTIONAL Quantity. See *Quantity*.

NOVACULA, is a Chirurgion's Knife, the Shape whereof differs according to the Difference of Operations.

NOVAL Assignment, in Law, is an Assignment of Time, Place, or the like, otherwise than as it was before assigned. See *Assignment*.

NOVEL Disseisin. See *Assize of Novel Disseisin*.

NOUNS (in Grammar) are such Words as signify the several Objects of our Thoughts.

NUBECULÆ are little light Particles which mutually, but loosely close with one another, and swim upon the Urine.

NUCAMENTUM in *Phytology*, or *Botanicks*, is the same with *Julus*. Which see.

NUCHA is the hinder part, or Nape of the Neck, called also *Cervix*.

NUCIOSITAS: the same that *Myopia*.

NUCIFEROUS Plants or Shrubs are such as bear Nuts.

NUCKIANÆ Glandule, are a sort of Glands (first taken notice of by Dr. Nuck) seated in that Orbit of the Skull, wherein the Eye is placed betwixt the abducent Muscle of the Eye, and the upper part of the *Oculus jugale*. Their Shape is various, in some Oblong, in others flatly Round, in others Oval, and in others somewhat Triangular.

NUCLEUS is the Edible part of the Kernel of any Nut, which is contained within the Skin of the Kernel; and in a larger Sense is by Botanists used for any Fruit or Seed contained within an Husk or Shell.

NUCLEUS also in an Astronomical Sense is by *Hewellius* and others used for the Head of a Comet, and by others for the Central Parts of any Planets.

NUCLEUS, in Architecture, is the middle part of the Flooring of the Ancients, consisting of Cement, which they put betwixt a Lay or Bed of Pebbles cemented with Mortar made of Lime and Sand.

NUDE Contract, in Law, is a bare Promise of a thing, without any consideration; and therefore 'tis said, *Ex nudo pacto non oritur actio*.

NUDE Master, in Common Law, is a naked Allegation of a thing done to be proved only by Witnesses, and not, either by Record or other Speciality in Writing under Seal.

NUMBER is Discrete Quantity, or a Collection of Unites, and is that which teacheth us to know how many any of the Objects of our Knowledge are.

Every Number in *Arithmetick* (which is the Art of Numbering truly) may be considered as composed of two Parts, of which one may be called the *Denominator*, and the other the *Numerator*.

Thus the Number 9, as it signifies the Thing Numbered, as the 9 Mules, or 9 Men, 9 Pounds, &c. is a *Denominator*: But as it expresses how many of that thing are taken or accounted, it is a *Numerator*. Therefore when the *Denominator* signifies a whole thing, the Number is called an *Integer*; but if it signify or stand for the Parts of any thing, then the Number is a *Fraction*.

Thus Nine Shillings, considered as distinct Things, are an *Integral Number*; but when you consider them as $\frac{9}{20}$ Parts of a Pound Sterling, that Number is a *Fraction*: And the Knowledge of this will facilitate the Understanding of the Doctrine of Fractions, which appears difficult to Beginners, because they do not consider that as well *Integer Numbers* as *Fractions* have both Numerators and Denominators: The Difference lying chiefly here, That in *Integers* the Ratio of the Denominators is certain, one and the same; but

Wells Anatomical.

9 8 7 6 5 4
46879035678946325012389765432017896

3 2 1
734532123456789876543210

NUMERATOR of a Fraction, is that Part of it which shews or numbers how many of those Parts which any Integer is supposed to be divided into, are expressed by the Fraction. Thus in $\frac{6}{11}$, 6 is the Numerator, (which stands

NYMPHOTOMY, is a Cutting off the *Nym-*
phæ, the too great Protuberance whereof in Mar-
riageable Virgins sometimes hinders the *Coitus*, or
at least renders it difficult. The *Egyptians* cut
them frequently, as *Galen* saith; but in our
Parts of the World such Instances have been
very rare.

OAKHAM, (a Term used in the Yards for building Ships) is Old Ropes untwisted and pulled again out fine, into loose Hemp or Flax, with a Design to drive it into the Seams, Trennels, and Rends of a Ship, to stop or prevent a Leak.

OAZY, or *Oazie Ground*: So the Seamen call soft, slimy, muddy Ground. This is not good Anchorage, because the Anchor cannot hold firm, but will *come home* (as they call it) in a Stress of Weather; besides it will rot their Cables, if a Ship ride long over such Ground: But then it is good to bring a Ship a-ground upon, because she can there dock herself, and lie soft; but yet if she lie long, she will rot her Plank, and spoil the Oakham in her Seams.

OBLÆ, is the *Sagittalis Sutura* in the Skull, (see *Sagittalis*) which touches the Coronal Suture forward, and the *Lamdoideal* backward; for it is made of the Mutual Conjunction of the Bones of the Forehead. *Blanchard*.

OBELISK, is a magnificent high Piece of Solid Marble, or other fine Stone; having usually Four Faces, and lessening upwards by Degrees, till it ends in a Point like a Pyramid.

OBJECTIVE Line. See *Line Objective*.

OBJECT-Glass, of a Telescope or Microscope, is that Glass which is placed at that End of the Tube which is next the Object.

OBLATA, is a Word used in the *Exchequer*, signifying old Debts brought together from precedent Years, and put to the present Sheriff's Charge.

OBLIGATION, is a Bond containing a Penalty, with a Condition annex'd, either for Payment of Money, Performance of Covenants, or the like; and so differs from a Bill that hath no Penalty nor Condition; and yet a Bill may be Obligatory.

OBLIGOR, is he that enters into such an Obligation; and *Obligee*, the Person to whom it is entered into.

OBLIQUE Ascension, is that Degree and Minute of the *Equinoctial* which riseth with the Centre of the *Sun* or *Star*, or with any Point of the Heavens, in an Oblique Sphere.

To find the Sun's Oblique Ascension by the Globe.

Bring the Sun's Place to the Horizon on the East-side; and the Number of Degrees intercepted between that Degree of the *Equinoctial* which is now come to the Horizon, and the Beginning of *Aries*, is the *Oblique Ascension*.

To find the Oblique Ascension, having the Right Ascension and Ascensional Difference given.

1. If the Declination be North, the Difference between the *Right Ascension* and the *Ascensional Difference*, is the *Oblique Ascension* required.

2. If the Declination be South, the Sum of the *Right Ascension*, and the *Ascensional Difference*, is the *Oblique Ascension*.

To find the Oblique Descension.

1. If the Declination be North, the Sum of the *Right Ascension*, and *Ascensional Difference*, is the *Oblique Descension*.

2. If the Declination be South, the Difference between the *Right Ascension*, and the *Ascensional Difference*, is the *Oblique Descension*.

OBLIQUE Angles. See *Angles Oblique*.

OBLIQUE Descension, is that part of the *Equinoctial* which sets with the *Sun* or *Star*, or with any Point of the Heavens, in an Oblique Sphere.

OBLIQUE Plains, in Dialing, are such as recline from the *Zenith*, or incline to the *Horizon*: The Obliquity of which *Inclination* or *Reclination*, is easily found by a Quadrant: Being an Ark of some Azimuth or Vertical Circle intercepted between the Vertex of the Place and of that Plane; also observe, this Azimuth or Vertical Circle is always perpendicular to the Plane.

OBLIQUE Sailing, is when the Ship runneth upon some Rhumb between any of the Four Cardinal Points, making an Oblique Angle with the Meridian; and then she changeth continually both Latitude and Longitude. There are Three kinds of *Oblique Sailing*, viz. *Plain Sailing*, *Mercator's* or *Wright's Sailing*, and *Great Circle Sailing*; which see.

The Seamen call also the Application of the Method of Calculating the Parts of Oblique Plane Triangles, in order to find the Distance of a Ship from any Cape, Head-Land, &c. *Oblique Sailing*.

OBLIQUE Sphere, is where the Pole is elevated any Number of Degrees less than 90 Degrees, and consequently the Axis of the World, the Equator, and Parallels of Declination, will cut the Horizon obliquely; whence comes its Name.

OBLIQUUS Superior, a Muscle of the Head, which ariseth fleshy from the back-part of the transverse Process of the first *Vertebra* of the Neck, and in its somewhat oblique Ascent becometh a fleshy Belly, and lessening it self again, is inserted to the *Os Occipitis*, laterally. By this together with its Partner, (they never acting separately) the Head is moved backwards on the first *Vertebra*.

OBLIQUUS Inferior, is a Muscle of the Head; arising fleshy from the External Part of the Spinal Process of the second *Vertebra* of the Neck, close by the Origination of the *Rectus Major*; and being dilated into a fleshy Belly, passes obliquely to its Insertion at the transverse Process of the first, where the former Muscle begins.

When this acts on either side, the transverse Process of the first *Vertebra* of the Neck is moved towards the Spine of the second; wherefore some Authors have reckoned it among the Muscles of the Neck. But since the Head is also moved thereby, and the Face turned on that side on which it acteth, it is not improperly reckoned amongst

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amongst the Muscles that move the Head; it is assisted by the *Mastioideus*.

OBLIQUUS Superior, or Trochlearis, is a Muscle of the Eye, which receives its First Denomination from its oblique Position and Course, in regard of the rest of its Fellows. The Second, it derives from that Cartilaginous Ring suspended near the Brink of the upper Part of the Orbit towards the Nose, thro' which its Tendon passes, being reflected on it, as a Rope on a Pulley: Besides which, it is called *Longissimus Oculi*, as exceeding the other in Length: Its Use is to help roll the Eye up and down.

It arises sharp and fleshy from the deepest part of the Orbit, near the Origination of the *Abducens*, and becoming a fleshy Belly as it passes obliquely close under its Superior Part, makes a round Tendon running thro' the *Trochlea*, (as above-mentioned) from whence reverting back, it is inserted to the *Tunica Sclerotis*, in the Middle of the Distance between the Termination of the *Astollens* and Optick Nerve, towards the back-part of the Bulb of the Eye.

OBLIQUUS Inferior, is a Muscle called also *Brevissimus Oculi*, it being the shortest Muscle of the Eye. This springs sharp and fleshy from immediately within the lower and almost outward Part of the Orbit, at the Juncture of the First Bone of the upper Jaw, with the Fourth; and becoming thicker, ascends obliquely over the *Depressor*, growing tendinous at its Insertion to the *Tunica Sclerotis*, near the Implantation of the former, directly betwixt the *Abducens* and Optick Nerves.

Its Use is to help roll the Eye to and fro, and therefore this and the former are by some called *Circumagentes* and *Amatorii*. Some also reckon Two other Muscles belonging to the Eye, which are called by this Name *Oblique*, viz.

OBLIQUUS Major, a Muscle that pulls the Eye forwards and obliquely downwards.

OBLIQUUS Minor, is a Muscle that pulls the Eye forwards and obliquely upwards.

OBLIQUUS Ascendens seu Acclivis, one of the large Muscles of the Abdomen, serving to compress the Belly, and by that means to help the Discharge of the Ordure and Urine; it also compresses and straitens the Cavity of the *Thorax* in Expiration, and helps to turn the Trunk of our Body to either side, when our Feet stand still; and so is a kind of *Antagonist* to the *Obliquus Descendens*, which see.

It arises fleshy from the whole circular Edge of the *Os Ilium* and *Ligamentum Pubis*; and thence mounting with an Order of Fibres, inclining forwards, it forms a broad membranous thin Tendon, which is implanted into the whole Length of the *Linea Alba*, and the Cartilages of the 8th, 9th, 10th, and 12th Ribs.

OBLIQUUS Descendens seu Declivis, the Name of one of the large *Epigastrick Muscles*, or Muscles of the Abdomen: Besides its Use, in common with the rest, to compress the Intestines and Bladder, and to help exclude the *Fetus*; Mr. *Cowper* assigns it another, not observed before by any one (except Dr. *Glisson*) which is to move our Body round to either side when our Feet stand still. It arises with several acute Productions, partly fleshy and partly tendinous, from the lower Margin of the Sixth, Seventh, and Eighth Ribs, where its several separate Originations lie

between the Indentations of the *Major Anticus*: Besides these, it continues to derive more Heads from the Ninth, Tenth, Eleventh, and sometimes from the Extremity of the lowest Bastard-Rib, where it is also indented with the *Serratus Inferior Pecticus*; thence its oblique descending fleshy Part expands it self into a broad membranous Tendon, before it marches over the *Rectus* to its Insertion in the *Linea Alba* and the *Os Pubis*; after this descending, it ends partly tendinous in the *Ligamentum Pubis*, but chiefly fleshy on the upper and fore-part of the circular Edge of the *Os Ilium*.

OBLIQUUS Auris, is a Muscle of the Ear, which may be also called *Semi-circularis*, from its Position, it lying in the external Parts of the Bony Channel of the *Aqueduct*, whence marching somewhat upwards and backwards, it enters the *Tympanum* in a very oblique Sinuosity excavated immediately above the Bone where the *Tympanum* is incased, and is inserted to the slender Process of the *Malleus*. The Sinuosity in which this Muscle passes, is that which may be taken notice of in the upper Part of the Bony Circle of the *Fetus*. This we don't find described any where, before *Du Verney*.

OBLONG, in Geometry, is the same with a Rectangle Parallelogram, whose Sides are unequal.

OBSCURA Camera, In Opticks, is a Room darkened, all but in one little Hole, in which is placed a Glass to transmit the Rays of Objects to a piece of Paper or white Cloth: But by it are made many useful Experiments in Opticks, serving to explain the Nature of Vision; and among which, the following one deserves a particular Description.

To represent all outward Objects in their proper Colours, Distances and Proportions, on a White Wall, a Frame of Paper, or Sheet hung up for that purpose in a Darkened Room.

This most Wonderful and Glorious Experiment, tho' it be very common, will yet well deserve to have a clear Account given of it here; for I don't remember to have read a plain and intelligible Description of its Apparatus any where; neither is it so easie to do it with Advantage, as those perhaps who never tried it may imagine; what follows therefore you may rely on as the Result of my own repeated Experience.

Procure a good Convex, or Plano-Convex Glass, such an one as is made use of for the Object Glass of a Telescope; and if you have a good Telescope that draws about 6 Feet, you may unscrew its Object Glass, and it will serve your Turn very well: And indeed a Glass that draws about that length (tho' 4 or 5 Feet will do pretty well) is the fittest on all Accounts to make this Experiment withal; for if you use a small Glass whose Focus is not above a Foot, or thereabouts distant from the Hole, the Representation of your Objects will be very small, and the Figures hardly large enough to be distinguished: To which likewise may be added, that not above one Spectator can come to look on it at a time, and even he not without some Trouble.

On the other hand, if you make use of a Glass which draws 15, 20, or 25 Feet, either your Hole

Hole must be very large, and then so much Light will come in as will hinder the Objects from being visible on the Wall, Paper, &c. or if the Hole be but small, so little Light will come in, that at the Distance of 15 or 20 Foot from the Window, you will have hardly Light enough to see the Representation distinctly; such large Glasses likewise are not easily had every where, nor are they every one's Money; but a Glass that draws about six Feet, is very proper to be made use of in this Case.

Having gotten such a Glass, make Choice of some Room which hath a North-Window, tho' an East or West may do well enough (but a South one will not, for a Reason to be given below) and let it be well darkened, so that no Light can come into it, but at the Hole where your Glass is placed, or at least but very little. Then make a Hole in the Shutter of the North-Window of about an Inch, or an Inch and $\frac{1}{2}$ in Diameter, and leave open the Casement, if there be one, for there must be no Glass without your Hole. Then fasten the Glass with its Centre in the Centre of the Hole, by some small Tacks to the Shutter, so that no puff of Wind blow it down, and break it; and at the Distance that you know your Glass draws, hang up a white Sheet; or if you do not know exactly the Focus of the Glass, move the Sheet to and fro till you find the Objects are represented on it very distinctly, and then you may fasten it there by Nails to the Ceiling, &c. Then will whatever is without the Hole, and opposite to it, be represented on that Sheet with such exquisite Exactness, as far surpasses the utmost Skill of any Painter to express. For if the Sun shine brightly on the Objects (as indeed this Experiment is never made well when it doth not), you will have the Colours of all Things there in their Natural Paint, and such an admirable proportion of Light and Shadow, as is impossible to be imitated by Art; and I yet never saw any thing of that kind that comes near this Natural Landscape. But if the Sun do not shine, the Colours will be hardly visible, and all will look dirty, dark, and confus'd; therefore I advis'd a North-Window, that you may have the Meridian Sun shining on your Object in its greatest Splendor, that so the Experiment may be in its greatest Perfection: But you must by no means have the Sun shine on or near the Hole, for if it doth, all will be confus'd.

Another Thing in which this Representation exceeds Painting, is, That here you have Motion express'd on your Cloth. If the Wind move the Trees, Plants or Flowers without, you have it within on your lively Picture; and nothing can be more pleasant than to see how the Colours of the moving Parts will change as they do without, by their being in various Positions obverted to, or shaded from the Light. The Motion of any Flies or Birds, is painted also in the same Perfection: And the exact Lineaments of any Persons walking at a due distance without the Glass, will be also express'd to the Life, and all their Motions, Postures and Gestures, will as plainly appear on the Cloth, as they do to any one's Eye without.

In a Word, Nothing is wanting to render it one of the finest Sights in the World, but that all things are inverted, and the wrong End upwards. To remedy which, several Methods have been

thought on, as double Convex-Glasses, &c. but none, in my Opinion, are so well, nor so easie, as to take a common Looking-Glass of about 12 or 14 Inches Square, and hold it under or near the Chin, with an acute Angle to your Breast: For if you do so, and look down into it, you will see all things upon the Sheet inverted in the Glass, i. e. in this case restored to their Natural and Erect Position; and this Reflection also from the Glass, gives it a Glaringness that is very surprizing, and makes it look like some Magical Prospect, and the moving Images, like so many Spectrums or Phantoms. And no doubt but there are many Persons that might easily be impos'd upon with such a Scene, and who would believe it to be no less than downright Conjururation.

And I have made use of this Experiment to convince some credulous Persons, that those are abus'd and impos'd upon, who see Faces in the Glasses of some cheating Knaves amongst us, who set up for *Cunning-Men*, and Discoverers of Stollen Goods, &c. and have satisfied them, that much more may be done by this, and some other Optical Experiments, and that without the Help of the Devil too, than by any of the Clumsie Methods us'd by these Vermin.

If the Glass be placed in a Sphere or Globe of Wood (having an Hole as large as the Glass bored through it) which like the Eye of an Animal may be turned every way to receive the Rays coming from all Parts of the Objects, it will be of good Advantage to the Experiment; and such, ready fitted, are now commonly sold by Mr. Marshall, at the Archimedes on Ludgate-hill, and are called *Sciopticks*.

And as by this Method any Image may be made appear in a darkened Room, Dr. Hook, in *Philosoph. Transact.* N. 38. gives a way of doing the same thing in an Enlighten'd one, either by Day or Night. The Experiment I have tried myself, and is as follows.

Opposite to the Wall, or Place where the Apparition is to be, let a Hole be made about a Foot in Diameter, or bigger; if there be an high Window that hath a Casement in it, it will do better.

Without this Hole, or Casement, so that the Company in the Room may not see what is done, place the Picture or Object you would represent inverted; and by means of Looking-Glasses plac'd behind, if the Picture be *Transparent*, reflect the Rays of the Sun, so that they may pass through it towards the Place where it is to appear; and that no Rays may go besides it, let the Picture be incompass'd with a Board or Cloth on every side. If the Object be a Statue or some living Creature, then it must be the more enlightened by casting the Sun-Beams on it by Reflection and Refraction both: Between this Object and the Wall, must be plac'd a broad Convex-Glass, ground of such a Convexity, that it may represent the Object distinct on the Wall: And therefore, 'tis best to have a clean Linen Cloth instead of the Wall; which may be hung up any where, according to the Distance of the Glass's Focus. The nearer the Glass is to the Object, the more will the Object be magnified on the Wall or Cloth; and the further off, the less; which also will depend on the Convexity of the Glass.

and descendeth from thence directly, between the Windpipe and *Vertebrae* of the Neck, and the Four first *Vertebrae* of the *Thorax*, upon which it resteth; but when it is come to the Fifth *Vertebra*, it giveth way to the descending Trunk of the great Artery, by bending a little to the Right side; afterward accompanying the Artery down to the Ninth *Vertebra*; there it turns a little to the Left again, and climbs upon the Artery; and by and by, about the Eleventh *Vertebra*, it passeth thro' the Midriff, a little on the Left side of its Nervous Centre; at a Hole distinct from that of the great Artery, and is inserted or continued into the Left Orifice of the *Ventricle*.

It is composed of Three *Membranes*; the Outermost is common to it and the Stomach, and is very thin, being endowed only with membranous Fibres, and those very slender. Some derive its Origin from the Midriff, some from the *Pleura*, and some from the Ligaments of the *Vertebrae* of the Neck and Breast, upon which it resteth: All which Opinions (according to Dr. *Glisson*) may be true, if they be intended only of an Origin of Continuation or Connexion, seeing it is continued plainly to the Three first, and knit to the last; but none of them is true, if they be intended of a sustaining or maintaining Origin, or of a Principle of Influence: The Second or Middle is fleshy and thick, and consists of Two Ranks of fleshy Fibres, which ascend and descend obliquely, (spiralwise) and do mutually intercrossate or cross one another, so as that the Fibre, which before it met with another to intersect, did lie underneath another, rides upon that which it intersects, and so continues uppermost, till it comes to a second, and so on by Turns. The Third or Innermost is endowed with slender strait Fibres, and those only, as Ancient Anatomists have taught; but Dr. *Willis* affirms it to have Fibres of divers kinds, and those diversly woven one with another. It is wholly nervous, saving a certain hoary or downy Substance that cloaths its Inside. It is continued to that Membrane that covereth the Mouth, Jaws and Lips; and (according to Dr. *Willis*) it descends Three Fingers Breadth below the Mouth of the Stomach.

From its being thus common to the Mouth, Gullet, and upper Orifice of the Stomach, proceeds that great Consent among these Parts in Vomiting, &c.

It hath *Veins* in the Neck from the Jugulars, in the *Thorax* from the *Vena sine pari*; but where it is joined to the Stomach, it hath some Twigs from the *Ramus coronarius*, which is a Branch of the *Vena porta*.

It hath *Arteries* in the Neck from the *Carotides*; in the *Thorax*, from the *Intercostals*; and in the *Abdomen*, from the *Ramus celiacus coronarius*.

Nerves it hath, from the *Par vagum* or Eighth Pair.

It hath Four *Glandules*; Two in the Throat, which are called *Tonsillae*, or Almonds, common to it and the *Larynx*, which separate a mucous or pituitous Humour to moisten them. Other Two it hath near its middle, on its out and backside, about the Fifth *Vertebra* of the *Thorax*; namely, where it gives way to the Trunk of the *Aorta*, and turns somewhat to the Right side, or at the Place where the *Aspera Arteria* is divided into two Branches. These are as big, each of

them, as a Kidney-bean, and of the same Shape; but sometimes there are more than two, and then they are less: They are soft and fungous; and their Use hath been reckoned to be for the Separation of a Juice to moisten the Gullet. But Dr. *Wharton* rejects this Opinion, because there appears no excretory Vessels that might convey the Liquor that is separated in them to within the Gullet. However, tho' such Vessels do not appear, yet it is more probable that they serve for that Use, than for that which he assigns to them, viz. to draw out from the *Lympha*, that runs thro' them, that Juice which is more mild and fit for Nourishment, for the Use of the Nerves that are fastened to them; or to deposit the Remainder into the common *Chyliferous Duct* by a Pipe, which he supposeth there must be, but does not describe.

The Gullet serveth as a Conduit to convey Meat and Drink by from the Mouth to the Stomach; for these being turned down into the Throat by the Tongue, all the Membranes of the *Pharynx* are relaxed for the Reception thereof, and presently the same are squeezed down the Gullet, by the Constriction of its middle Coar, and the Muscles of the *Pharynx*.

OFFA Alba. So *V. Helmont* calls a white Coagulation which will arise, if equal Parts of highly Rectified Spirits of Wine and Urine be mix'd and shaken together; but the Spirit of Urine must be distilled from well-fermented Urine, and it must be truly dephlegmated, or else it will not succeed.

OFFICE, signifies not only that Function, by Virtue whereof a Man hath some Employment in the Affairs of another; but also an Inquisition made to the King's Use of any thing, by virtue of his Office who enquireth: And therefore we oftentimes read of an Office found, which is nothing else but such a thing found by Inquisition made *ex officio*. And 'tis used in this Sense in 33 H. 8. 20. and in *Stamf. Prærog.* Fol. 6. 61. Where to traverse an Office, is to traverse the Inquisition taken of an Office. And in *Kitchin*, Fol. 177, to return an Office, is to return that which is found by virtue of the Office. And there be two sorts of Offices, in this Signification, issuing out of the Exchequer by Commission, viz. An Office to entitle the King to the Thing enquired of, and An Office of Instruction. Office in Fee, is that which a Man hath to himself and his Heirs.

OFFICIAL. This Word, by the Ancient Civil Law, signified him that was the Minister or Apparitor of a Magistrate or Judge. In the Canon Law it is specially taken for him to whom any Bishop doth generally commit the Charge of his Spiritual Jurisdiction: And in this Sense, one in every Diocese is *Officialis Principalis*, whom the Statutes and Laws of this Kingdom call Chancellor: The rest, if there be more, are by the Canon Law called *Officiales Foranei*, but in Common Law Commissioners. The Difference of the Two Powers you'll find in *Linwood, Tit. De Sequestra possess.* cap. 1. *verbo Officialis*. And this Word *Official*, in our Statutes and Common Law, signifies him whom the Arch-deacon substituteth in the executing of his Jurisdiction.

Officiatus non faciendis vel amovendis, is a Writ directed to the Magistrates of a Corporation, willing them not to make such a Man an Officer, and to put him out of the Office he hath; until Enquiry

Enquiry be made of his Manners, according to an Inquiry formerly ordained.

OFFIN. So the Seamen call that Part of the Sea which is a good Distance from Shoar, where there is deep Water, and no need of a Pilot to conduct the Ship into the Port. Thus if a Ship from Shoar be seen sailing out to Sea-ward, they say she stands for the *Offin*; and if a Ship having the Shoar near her, have another good way without her, or towards the Sea, they say that Ship is in the *Offin*.

OFF-WARD. If a Ship, being a-ground by the Shore, doth heel towards the Water-side, they say she heels to the *Off-ward*; so if she lie with her Stern only to Sea-ward, they say she lies with her Stern to the *Off-ward*, and her Head to Shoar-ward.

OGRESSES, a Term in Heraldry; the same with *Pellets*, which see.

OIL, which the Chymists call *Sulphur*, is the Second of their *Hypostatical* and of the true Five Chymical Principles. 'Tis an inflammable, unctuous, subtil Substance, which usually arises after the Spirit. The Chymists attribute to this Principle all the Diversity of Colours, and all the Beauty and Deformity of Bodies: Probably their various Odours do in a great measure arise from it. And it sweetens the Acrimony of Salts; and by stopping or filling up the Pores of a mixt Body, keeps it longer from Corruption, where it abounds. And we find that the *Ever-greens*, such as *Box*, *Holly*, &c. do abound more with Oil than other Plants.

There are two sorts of Oils; One which seems to be mixt with Spirit, (for it can never be drawn pure) and which will swim upon Water; such as Oil of Aniseeds, Lavender, Rosemary, &c. which the Chymists call *Essential*, and is commonly drawn in a Limbeck with store of Water. And another kind, which probably is mixt with Salts, and these will sink in Water; such as the Oils of ponderous Woods, as of Guaiacum, Box, Cloves, &c.

There are some things which are very improperly called Oils; as Oil of *Tartar per Deliquium*, which is only a Fixt Salt dissolved. Oil of *Vitriol*, which is nothing but the most caustick and strongest part of the Spirit of *Vitriol*. Oil of *Antimony*, which is only a Mixture of Antimony, and an acid Spirit.

Mr. Boyle, to shew the Producibleness of Chymical Principles, tells us, That by mixing carefully and gradually together an equal Weight of Oil of *Vitriol*, and truly rectified Spirit of Wine; and then, by a very wary Management of the Fire, drawing off what will come over, he could obtain (besides a subtil odoriferous Spirit, and an acid and sulphurous Liquor) a considerable Quantity of Chymical Oil, sometimes deeply coloured, sometimes pale like Water, and sometimes exceeding fragrant, and without any Acidity in it at all; yet was so ponderous, as not only to sink in Water, but even in the acid Spirit which was drawn off with it, and seems to be the Oil of *Vitriol* only altered and exalted; nor would this Anomalous Oil at all mingle with Water, tho' both the Oil and Spirit, from whence it was distilled, would readily do so.

OIL of Philosophers. So the Vapouring Chymists call a Distillation in a Retort of pieces of Brick heated red hot, and then cast (while so)

into Oil of Olives, the Bricks will imbibe a good deal of Oil; which Oil being afterwards drawn from them again, is their Oil of *Bricks*, or Oil of *Philosophers*; and they attribute great Virtues to it.

OIL of Sulphur per Campanam. See *Spirit of Sulphur*.

OIL of Tartar per Deliquium, is a Fixt Salt of Tartar dissolved, by being exposed to the Air in a cool moist Place.

OIL of Vitriol, improperly so called, is what remains in the Cucurbit after the Distillation of *Vitriol* is rectified, and the Sulphureous and Acid Spirit both drawn off; 'tis the more Fixt Part of the Spirit of *Vitriol*, rendered Caustick by a vast Degree and Continuance of Fire. 'Tis used in the Dissolution of Metals, and sometimes given inwardly, when in a small Dose, and duly diluted.

This Oil, if it be mingled either with Spirit of *Vitriol*, common Water, or any *Etherial Oil*, as the Chymists call Oil of Turpentine, &c. it will grow so very hot, as often to break the Vial that contains the Mixture.

OLEAGINOUS, Oily, or pertaining to the Nature of Oil: Thus in Soap, which is made of Oil, (or Grease) Salt and Water; we say there are some *Oleaginous*, some *Saline*, and some *Aqueous* Parts.

OLECRANUM, or *Ancon*, is the greater Process of the first Bone of the Cubit called *Ulna*; also the upper part of the Shoulder: *Blanchard*.

OLIGOTROPHUS (*Cibus*) is Meat that nourishes little; to which is opposed *Polytrophus*, that which affords much Nourishment. *Blanchard*.

OLIGOTROPHY, is a Decrease of Nutrition; or a very small one.

OLFACTORY Nerves, or those which give us the Sense of Smelling, are the first Pair of those Ten which arise from the *Medulla oblongata*: They come from the Basis of the *Corpora striata*, and passing through the little Holes of the *Os cribriforme*, they are spread upon the Membrane which covers the *Os spongiosum*.

OLIVARIA Corpora, are two Protuberances of the under part of the Brain, placed on each side of the *Corpora Pyramidalia*, towards the lower end; having their Name from their Figure, which is like that of an Olive.

OLOR. See *Cygnus*.

OLYMPIAD, a Term in Chronology, signifying the Space of Four Years, or Fifty Months, reckoning Thirty Days to a Month; from whence the Ancient *Grecians* derived their Account of Time. This kind of Computation took its Rise from those Famous *Olympick Games* which were celebrated every Fifth Year, in the Festival Solstice, during Five Days, on the Banks of the River *Alpheus*, near the City *Olympia*, where the noted Temple of *Jupiter Olympicus* stood. The First *Olympiad* began about 500 Years after the Destruction of *Troy*, in the 3938 Year of the *Julian Period*, A. M. 3174, and 766 Years before Christ.

OMENTUM, *Rete*, or *Reticulum*, the Cawl, is a double Membrane arising from the *Peritoneum*, or as some say, from the *Mesentery*, spread upon the Intestines or Guts, interwoven with fat and small Vessels like a Fisher's Net, enriched also with two or three Glandules; on the Fore-part it is annexed to the Bottom of the Stomach.

math, to the Gut Colon, to the Spleen; and sometimes to the *Pancreas*, and the round Lobe of the Liver.

Its Use is to cherish the Intestines with its Warmth, and to facilitate the Concoction of the Aliments in the Guts, as well as to knit loosely the Stomach, Spleen, *Pancreas*, Colon, &c. together.

It hath some Milky and Lymphatick Vessels, as also a great many *Ductus's*, and little Bags of Fat.

OMOPLATA, and *Homoplata*, the same with *Scapula*.

OMPHALMICUS, is a Branch of the Fifth Pair of Nerves which move the Eye.

OMPHALOCLE, is a Rupture about the Navel, to wit, when the Cawl or Intestines are Protuberant in that Part; which happens from a Relaxation, or bursting of the *Peritonaeum*.

ONERANDO *pro rata portiois*, is a Writ that lies for a Joint-Tenant, or Tenant in Common, that is distrained for more Rent than his Proportion of the Land cometh to.

ONL. In the *Exchequer*, as soon as a Sheriff enters into his Accompts, for Issues, Amerciaments, and mean Profits, they set upon his Head this Mark, *Oni*, which denotes *Oneratur*, *nisi habet sufficientem exonerationem*; and thereupon he forthwith becomes the King's Debtor, and a Debt is set upon his Head; and then the Parties *Peravayle* become Debtors to the Sheriff, and discharged against the King.

ONYX, the same with *Hypopyon*, a gathering of Matter under the *Tunica Cornea* of the Eye.

OPACOUS Bodies, are such whose Pores (probably) lying in an oblique and crooked Position, the Rays of Light cannot freely permeate and pass through them, as they do thro' transparent ones; wherefore if you hold them up against the Light, you cannot see through them.

OPEN Flank, in Fortification, is that part of the Flank which is covered by the Shoulder or Orillon.

OPERA, is a sort of Solemn Entertainment of Musick upon the Theatre or Stage, and is very common in *France* and *Italy*: It usually begins with an *Ouverture*, which commonly ends with a *Fugue*; the rest is composed of *Symphonys*, *Recitativo's*, *Chaccons*, *Preludes*, &c. with all sorts of Vocal and Instrumental Musick.

OPHIASIS, is a Disease where the Hairs grow thin and fall off here and there, so that they leave the Head spotted like a Serpent. *Blanchard*.

OPHIUCUS, one of the Northern Constellations, the same with *Serpentarius*: It contains 30 Stars, of which, one in the Head of the Man holding the Serpent, is of the second Light or Magnitude.

OPHTHALMICKS, are such Medicines as are good for Diseases in the Eyes.

OPIATES, are Medicines made of *Opium*, or something of the same Nature with it, designed to cause Sleep, and to ease Pain: When they produce the latter Effect, they call them *Anodynes*; when the former, *Hypnoticks*; and when they cause a very great Sleep or Stupefaction, *Narcoticks*. The Foreign Physicians confound an *Opiate* and an *Eletuary*; see *Blanchard* on the Word *Opiata*.

OPISTHOTONUS; see *Posticum*.

OPISTHOTONUS, or *Tetanus*, is a kind of

Cramp, or stretching of the Muscles of the Neck backwards; which proceeds sometimes from a Palsie of the Muscles of the Neck, whereupon the Antagonists or opposite Muscles move the intermediate Parts too much; or from a sharp and serous Matter in the Tendons; or from the Animal Spirits which enter the Fleishy Pipes more than usual, and will not easily recede, so that the Parts are swelled and wrinkled up. *Blanchard*.

OPPOSITE *Angles*; see *Angles*.

OPPOSITE *Cones*, are two Similar Cones veritically opposite, and having the same common Axis. And

OPPOSITE *Sections* are the two *Hyperbola's* made by a Plane cutting both those Cones. See the Figure under the Word *Latius Transversum*, where the Cones *VAD* and *BVA* are opposite, and the Sections *ODO*, *OEO*, are opposite *Hyperbola's*.

OPPOSITION, is that Position or Aspect of the Stars or Planets, when they are 6 Signs, or 180 Degrees distant from one another, and is marked thus 8.

OPTATIVE Mood, (in Grammar) is the way of forming a Verb so, as that it may express an ardent Desire that such a Thing may happen; and therefore there is usually an Adverb of wishing connected with it, as *Utinam*, &c.

OPHTHALMY, is an Inflammation of the Tunicks of the Eyes, proceeding from Arterious Blood, collected and extravasated there, because it cannot return by the Veins. *Blanchard*.

OPTICKS, is a Mathematical Science that treats of the *Sight* in general, and of every thing that is seen with direct Rays; and explains the several Properties and Effects of Vision in general, and properly of that which is direct and ordinary: For when the Rays of Light are considered as reflected, the Science which teaches their Laws and Properties, is called *Catoptricks*; and when the Refraction of Rays is considered, and the Laws and Nature of it explained and demonstrated, the Science is called *Dioptricks*. So that *Opticks* comprehends the Whole; of which *Catoptricks* and *Dioptricks*, are the two Parts.

OPTICK Glasses. Sir Isaac Newton, in his *Philos. Natur. Princip. Math. Lib. 1* Schol. ad Prop. 98, says, That for all Optick Uses, Spherick Figures are the most commodious. If the Object-Glasses of Telescopes were composed of two Spherick Glasses containing Water between them, perhaps the Irregularity of the Refractions that are made on the Surfaces of the Glasses towards their Edges, may be accurately enough corrected by the Refractions of the Water. And such Object-Glasses are preferable to Elliptick or Hyperbolic Glasses, not only because they are easier and more accurately to be formed, but also because they refract more accurately those Pencils of Rays that are (collateral, or) out of the Glasses Axis. But the different Refrangibility of different Rays will for ever hinder us from perfecting Opticks by Glasses, either Spherick, or of any other Figures whatsoever: And unless we can correct the Errors that arise from hence, all our Labour is lost in other Corrections.

Nor indeed is it possible, by whatever Figures, to render the Appearance of the Collateral Parts of an Object so distinct as the Direct; for the very Natural Eye does it not: And therefore we are

are forced to apply it successively, *directly* before the Parts of any Object we design to view.

To know whether Optick-Glasses be truly Centered, or not.

First Way.

Holding the Glasses at a due Distance from the Eye, observe the two reflected Images of a Candle; for where those two Images unite, or *coalesce*, there is the true Centre of the Glasses: And if this be in the middle or central Point of the Glasses's Breadth, the Glasses is truly centered.

A Second Way is

By presenting the Glass before the Sun, and making it reflect the Light on a Plane highly parallel to its Surface, and at a proper Distance; for then you'll perceive two sorts of Light reflected, one smaller, but much more strong and vigorous, within another more faint and large. Then by a due Posture of the Glass (found by Trials) both these Lights are to be projected as round as possible, and at a proper Distance from the Wall on which they are reflected; the round brightest Spot is to be brought into the smallest Compass that it can. (Trial will make all this plain.) When the Glass is in this Posture, if the bright Spot be projected just in the middle of the fainter Light, the Glass is well centered: But to whatever side of the faint Light this bright Spot is projected, on that side is the Glass thickest, and on that side lies the true Centre.

A Third Way

Of Examining the Centres of Glasses, is yet more Compleat than the former: For it does not only discover the Fault, (if there be any, as in long Object-Glasses 'tis very rare but there is, especially if they be wrought in the Form by the unguided Hand, and not by an Engine) but without it rectifies the Fault; and is thus:

Cover the Surface of the Glass within a thin piece of Paper, in which there is cut a round Hole of about an Inch Diameter; about this Hole there are to be struck two or three Concentrick Circles. Move this Paper upon the Glass, 'till you see on the Plane that receives the reflected Light, that the bright Spot is exactly in the middle of the other fainter Light round it.

This also one may measure by a Pair of Compasses, having, to that end, slightly fix'd the Paper to the Glass, that we may more nicely determine whether this bright Spot be exactly in the middle. This therefore being carefully adjusted, by gently sliding the Paper on the Glass, (if it be requisite) we are, without the least altering this true Position of the Paper, to fix it more firmly to the Glass; and laying it thus on a Table, let us mark on the Glass (by the Point of a Diamond) three Points in one of the Circumferences concentrick to the round Hole in the Paper; and sticking a small piece of Cement on the Glass, about the middle of the round Hole, by means of the three marked Points let us find the exact Centre of this round Hole: Then uncovering the whole Glass, (except only the Cement in which

the Centre is marked) with a Diamond-pointed Compass let us strike as large a Circle on the Glass as its Breadth will bear; then round the Glass according to this Circle, and 'tis as exactly centred as the Sense can judge.

For trying the Regularity and Goodness of an Object-Glass, to the greatest Exactness.

On a Paper strike two Concentrick Circles, one whose Diameter is the same with the Breadth of the Object-Glass, 't'other, of half that Diameter: This inward Circumference divide into six equal parts, by the known way of applying the Radius six times in the Circumference, and making six fine small Holes therein with a Needle. Let us cover one side of the Glass with this Paper, and then exposing it to the Sun, we are to receive the Rays that pass through these six Holes, on a Plane, at a just Distance from the Glass; and by withdrawing or approaching this Plane from or to the Glass, we shall find whether the Rays that pass through these six Holes unite exactly together at any Distance from the Glass; if they do, we may be assured of the Regularity of the Glass, that is of its just Form; and at the same time we obtain exactly the Glass's Focal Length.

But, after all, there is no better way for trying the Excellency of an Object-Glass, than by placing it in a Tube, and trying it with small Eye-Glasses, at several distant Objects: For that Object-Glass that represents the Objects the brightest and most distinct, that bears the greatest Aperture, and most Convex and Concave Eye-Glass, without Colouring or Haziness, is surely the best. The most convenient Object to try them at, is the Title Page of a large Book, where there are generally Letters printed of divers Magnitudes, and therefore affords Variety of small Objects; whereby the Comparative Excellency of Object-Glasses may be nicely estimated.

OPTICK Nerves, or the *Nervi Visorii*, are the Second Pair, which bestow on the Eyes the Faculty of Seeing. They spring from the upper sides of those unequal Protuberances of the *Cruca* of the *Medulla oblongata*, which are called *Nervi opticorum ophiorum thalami*; from whence being carried forward, and somewhat downwards, after having fetch'd a Compass, they meet one another about the *Infundibulum*, upon the *Sella* of the *Ossphenoides*; where they are united by the closest Conjunction, but not Confusion, of their Fibres, which run parallel lengthways in these Nerves, as they do in all other.

They are obscurely hollow untill they be united; but after, their Hollowness cannot be discerned. This Hollowness may be shew'd in a large Beast newly killed, and in a clear Light.

Thus do *Riolanus*, *Glisson*, &c. teach; but *Vesalius*, *Aquapendente*, &c. deny that they have any manner of Cavity. *Malpighius* says, they have not one Cavity only, but sundry; but that these Cavities result only from the Necessity of their Structure, all their inner or medullar part consisting of round *Intestinnula* of Fibres running lengthways, which cannot be so closely fitted to one another, but that there will result long Interstices, which yet perhaps are of no use, nor of

the Nature of Ducts, but only accidental; but whether the *Intestinales*, or Filaments themselves, have not little Channels in them (like to Blood-vessels) he thinks may be doubted of: But seeing Sense hath not discovered any such, 'tis probable that there are to be admitted only little Pores and Interstices in the medullary Substance, by means whereof the nourishing and vivifying Juice may be propagated. After their Union they are separated again, and each of them running farther forwards, passes thro' an Hole of the *Os Cuneiforme*, and is inserted obliquely into the Centre of the Eye on its own side.

Dr. Willis says, they receive not only nervous Fibres from the Third Pair of Nerves, but also Twigs of Arteries from the fore Branches of the *Carotides*, which run upon them as far as the *Basis* of the Eye: Whence, he thinks, a Reason may be assign'd, why, when a Man grows sleepy after plentiful eating or drinking, he presently feels a notable Heaviness or Oppression as it were about his Eyes. For when the Blood, becoming very turgid, fills the Vessels that run through the Brain, more than usual, and by distending them, stops the Pores of the Brain; these Nerves also in their whole Course are compressed by the Blood that is become turgid in their Blood-Vessels likewise.

Dr. Ridley says, That he has seen the Blood-Vessels to run not only upon or within them, but also in injected Bodies exactly quite thro' the medullary Substance of them, into the Reticular Coat of the Eye, wherein they end in an infinite Number of the most capillary Ramifications, which, by an Injection of that Artery, made with Mercury, becomes very delightfully conspicuous to the Eye.

They are very soft, so long as they are within the Skull; but having pass'd the *Os sphenoides*, they become somewhat more firm and hard. The Reason of which Alteration seems to be, that within the Skull they are only clad with the *Pia mater*; but as they go out, they assume a Second Coat from the *Dura mater*.

From the whole Substance of these Nerves, viz. from their two Membranes and the inner medullary and fibrous Substance, are the three (proper) Tunics of the Eyes framed; for the *Cornea* or *Sclerotica* doth proceed from the *Dura mater*, the *Choroides*, or *Uvea* from the *Pia mater*, and the *Retina* from the marrowy Substance.

OPTICK Place of a Star or Planet, is that Point or Part of its Orbit which is determined by our Sight when the Star is there: And this is either True, when the Observer's Eye is supposed to be at the Centre of the Earth or Planet he inhabits; or Apparent, when his Eye is at the Circumference of the Earth: And the Difference between these two is the *Parallax*, whose Use is great in determining the Distances of the Planets, &c.

OR, (French) in Heraldry, is the Colour of Gold; and they say without this, or *Argent*, there can be no good Armoury. In the Coats of Nobles 'tis called *Torraz*, and in those of Sovereign Princes, *Sol*. 'Tis represented in Engraving by small Points or Pricks, thus.



ORB, is only a Hollow Sphere.

ORBICULAR Bone, is one of the little Bones of the inward Ear, ty'd by a slender Ligament to the sides of the *Strapes*,

ORBICULARIS, or *Constringens*, or *Osculatus*, is a Muscle that draws both Lips together: 'Tis called also *Sphincter Labiorum*.

ORBICULARIS *Palpebrarum*, is a thin fleshy Muscle, whose Fibres do Circularly environ the Eye-lids, and are inserted to them, (like the *Sphincter Labiorum*) not adhering to any Bone, from whence we may derive their Origin, except the Superior part of the great Bone of the Nose, by some reckoned the fourth Bone of the Upper Jaw: The Muscle acting like the *Sphincters* of all other Parts, constringes the Eye-Lids.

ORBIS *Magnus* is the Orbit of the Earth in its Annual Revolution round the Sun.

This *Copernicus*, Dr. Gregory, and some others, will have to be but a Point in comparison of the Distance between us and the fix'd Star's: But our most Accurate Astronomer, Mr. Flamsteed, found a very sensible Parallax of this *Orbis Magnus*, in respect of the Pole Star; so that the Pole Star was nearer to the Pole in Summer (at the Solstice) than in Winter by 40 or 45"; and this was the Result of above Seven Years most Accurate and continual Observation: And from hence he justly draws a *Demonstration* for the Annual Motion of the Earth. Vide *Wallis Latin Works*, Tom. 3.

The Semi-diameter of this Annual Orbit of the Earth round the Sun, Dr. Gregory makes to be 50000000000, or Fifty Thousand Millions of Feet; which is (allowing 5280 Feet to a Mile) 94.696969 Miles *Englishe*. Which therefore may be taken for the mean Distance of the Earth from the Sun. And the Semi-diameter of *Saturn's* Orbit, is about 10 times as great.

All the Ancients and the Astronomers before the Great *Kepler* supposed this Orbit to be a perfect Circle, but he proves it to be an Ellipsis; the remotest end of whose Longer or Transverse Diameter is eight Signs and eight Degrees distant from the first Star in *Aries*, and having the Sun in one of its Focal Points.

ORBIT of any Planet, is the Curve that it describes in its Revolution round its Central Body: Thus the Orbit of the Sun (or of the Earth) in its Annual Course, is the *Ecliptick*.

ORBITER *Externus*, is a Hole in the *Os Maxillare*, below the Orbit, thro' which the Nerves and Vessels which come from the Teeth, pass to the Cheeks.

ORBITER *Internus*, is a Hole in the *Coronal Bone*, within the Orbit a little above the *Os Planum*, thro' which passes a Branch of the fifth pair of Nerves which goes to the Nose.

ORDER is a Term in *Military Discipline*, being the equal Distance of one Rank or File from another. The usual Order in Files is 3 Foot, and in Ranks 6 Foot; the Open Order is double in each.

ORDER in Architecture, is a Rule for the Proportion to be observed in the erecting of Pillars, and for the form of certain parts appertaining to them.

So Buildings are said to be of several Orders, when the Proportion between the thickness of the Columns, and their height, together with all things requisite thereto are different.

There are Five Principal Orders of Architecture, viz. The *Tuscan*, *Dorick*, *Ionick*, *Corinthian*, and the *Composit*.

The *Tuscan* is the most Simple, and the most destitute of Ornaments, so that it is seldom used except

except in Vaults, in some Rustick Edifices, vast Piles of Buildings, as *Amphitheatres*, &c.

The *Tuscan Pillar* with its Base and Capital generally hath for its height seven Diameters of its thickness taken below, and the top ought to be diminished one quarter of its Diameter: The Pedestal is very plain, and only one Model high.

The *Dorick Order*, hath its Column eight Diameters high, and ought to have no Ornament neither in its Capital nor Base. The *Astragal* and *Listel* below the Capital, which is half a Diameter high, constituting part of the Shank or Body of this Pillar.

The *Ionick Order*, when first invented had its Column only eight Models high; but the Ancients designing to make it more beautiful, augmented the height of the Pillars, and added a Base not used before; so that with its Capital and Base it contains nine Diameters of its thickness taken below: The Pedestal is two Diameters, and about two thirds high; and the Capital is chiefly composed of *Voluta's* or Scrolls, which render it different from the other Orders: The *Ionick Pillars* are also usually channelled with 24 Flutes.

The *Corinthian Order*, is the finest and richest of all; the Length of its Columns with their Bases and Capitals, is commonly about nine and a half or ten Diameters; and the Capitals are adorned with two Rows of Leaves, and eight *Voluta's* that support the *Abacus*.

The *Composite or Roman Order*, hath the Capital of its Pillar composed of two Rows of Leaves like the *Corinthian*, and of the *Voluta's* or Scrolls of the *Ionick*. These Columns are usually ten Diameters high, altogether like the *Corinthian* in all its Dimensions and Numbers, except the Capital, which hath only four *Voluta's* taking up the whole Space, which is filled both by the *Voluta's* and Stems or *Skalks* in the *Corinthian*.

To these Five Orders, may be added also,

The *Attick*, which is a small Order of Pilasters of the shortest Proportion, having a Cornice raised after the manner of an Architrave, for its Entablature. As also

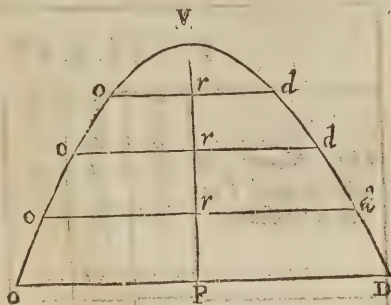
The *Gothick Order*, which is so far from the ancient Proportions and Ornaments, that its Columns are either too massie in form of vast Pillars, or as slender as Poles, having Capitals without any certain Dimensions, carved with the Thorny Leaves of *Thistles*, *Coleworts*, *Bears-foot*.

ORDINANCE, of Parliament, the same with *Acts of Parliament*: And Acts of Parliament are in the Parliament-Rolls often called *Ordinances of Parliament*. If there be any Difference, it is, that an *Ordinance* is but Temporary, and to be alter'd by Commons alone; but an *Act* is a perpetual Law, and cannot be altered but by King, Lords and Commons. But Sir *Edw. Coke* asserts, That an *Ordinance of Parliament* is to be distinguished from an *Act*, for as much as the latter can be only made by the King and the threefold Consent of the Estates, whereas the former is ordain'd with or by two of them.

ORDINARY, in the Civil Law, signifies any Judge that hath Authority to take Cognizance of Causes in his own Right, as he is a Magistrate, and not by Deputation; but in the Common Law, it is taken for him that hath exempt and immediate Jurisdiction in Causes Ecclesiastical.

ORDINARIES, in Heraldry, are such Charges as are proper to the Art and Usage of Armory; and therefore are commonly called the Honourable Ordinaries; and are the *Cross*, the *Chef*, the *Pale*, the *Bend*, the *Fesse*, the *Escutcheon*, the *Chevron*, the *Saltier*, and the *Bar*.

ORDINATE, or *Ordinate*. *Applicate*, is a Line in any Conick Section drawn at Right Angles to and bisected by the *Axis*, and reaching from one side of the Section to the other; the half of which is properly the *Semi-ordinate*, but is now usually called the *Ordinate*.



Thus, in the Parabola OVD, OD, or *o d*, is an Ordinate rightly apply'd, and its half *r d*, or RD, is the true Semi-ordinate, tho' usually called the Ordinate it self.

The Properties of these Lines you will find under the several Conick Sections.

Dr. *Wallis* in his *Conick Sections*, calls the whole Ordinates OD, &c. the *Linee Ordinariae Inscriptae*; and the Semi-ordinates OR, &c. he calls the *Ordinate Applicatae*.

ORDINATIONE *contra servientes*, is a *Writ* that lieth against a Servant for leaving his Master.

ORDNANCE, all sort of Great Guns used in War. The several Parts of a Piece of Ordnance; or Great Gun, are thus called.

1. The Outside round about the Piece, is called the *Superficies of her Metal*.

2. The Substance or whole Mass of Metal, is called her *Body*.

3. The Part next to us when she stands ready to fire, is called the *Breech* or *Coyles*, and the Pummel or round Knob at the End of it, is called the *Cascabel*; by some the *Cascabel Dock*.

4. The *Trunnions* are the two Knobs, Spindles, or Ears, which hold the Piece in the Carriage.

5. *Manigions* or *Dolphins*, after the German way of casting Guns, are two Handles placed on the Back of the Piece near the *Trunnions*, and near the Centre of Gravity, to mount and dismount it the more easily.

6. The *Rings* about it are these four: The *Base Ring* is that which is next below the *Touch-hole*: The next *Ring* above the *Touch-hole* is called the *Reinforced Ring*: The next to that forward the *Trunnion Ring*: The next to that, the *Cornice-Ring*: And that at the *Mouth* is called the *Muzzle-Ring*, or the *Freeze*: Also all the *Rings* near the *Mouth* are sometimes called the *Freezes*.

7. As to the *Internal Parts*, the whole *Cavity* or *Bore* of the Piece is called her *Chase*. That Part of the *Cavity* between the *Trunnions*, and the *Muzzle* or *Mouth*, is called the *Vacant Cylinder*: The Part from the *Trunnions* to the end of the *Cavity*, or so much of it as containeth (or is Loaded with) the *Powder* and *Shot*, is called the *Chamber*. The *Diameter* of the *Mouth* is called

the *Calibre*. The *Space* between the *Shot* and the *Hollow Superficies* of the Piece within is called the *Vent*; being the *Difference* between the *Diameter* of the *Shot*, and of the *Mouth* of the Piece.

Great Guns in *England* are distinguished into two kinds only, viz. *Field-Pieces*, which are from the least sort of all, to 12 Pounders (*i. e.*) those which carry a *Ball* or *Shot* of 12 Pound; and *Cannon of Battery*, which are from a *Calvering* to an whole *Cannon*.

The Table following gives you all things necessary to be known of the *Names*, *Proportions*, *Weights*, *Lengths*, *Bullets*, *Ranges*, &c. of a Great Gun.

PHILLIPS'S TABLE.

The Names of the several Pieces of Ordnance.	Guns Length.	Guns Weight.	Guns Bore.	Bullets Diameter.	Bullets Weight.	Ladies Length.	Ladies Breadth.	Weight of Powder.	Point-Blank, or the Level Range.	Urmolt Random.
	Inches. Feet.	Pounds.	8 Parts. Inches.	8 Parts. Inches.	Ounces. Pounds.	8 Parts. Inches.	8 Parts. Inches.	Ounces. Pounds.	Paces.	Paces.
A Base ———	4 6	200	1 2	1 1	0 5	4 0	2 0	0 8	60	600
A Rabinet ———	5 6	300	1 4	1 3	0 8	4 1	2 4	0 12	70	700
A Falconet ———	6 0	400	2 2	2 2	1 5	7 4	4 0	1 4	90	900
A Falcon ———	7 0	750	2 6	2 5	2 8	8 2	4 4	2 4	130	1300
A Minion Ordinary	7 0	800	3 0	2 7	3 4	8 4	5 0	2 8	120	1200
A Minion Largeſt	8 0	1000	3 2	3 0	3 12	9 0	5 0	3 4	125	1250
Saker Leaſt ———	8 0	1400	3 4	3 2	4 12	9 6	6 4	3 6	150	1500
Saker Ordinary ———	9 0	1500	3 6	3 4	6 0	10 4	6 6	4 0	160	1600
Saker Old Sort ———	10 0	1800	4 0	3 6	7 5	11 0	7 2	5 0	163	1630
Demiculverin Leaſt	10 0	2000	4 2	4 0	9 0	12 0	8 0	6 4	174	1740
Demiculv. Ordinary	11 0	2700	4 4	4 2	10 11	12 6	8 0	7 4	175	1750
Demiculv. Old ſort	11 0	3000	4 6	4 4	12 11	13 4	8 4	8 8	178	1780
Culverin Leaſt ———	11 0	4000	5 0	4 6	15 0	14 2	9 0	10 0	180	1800
Culverin Ordinary	12 0	4500	5 2	5 0	17 5	16 0	9 4	11 6	181	1810
Culverin Largeſt ———	12 0	4800	5 4	5 2	20 0	16 0	10 0	11 8	183	1830
Demi-Cann. Leaſt	11 0	5400	6 2	6 0	30 0	20 0	11 4	14 0	156	1560
Demi-Cann. Ordin.	12 0	5600	6 4	6 1	32 0	22 0	12 0	17 8	162	1620
Demi-Can. Large	12 0	6000	6 6	6 3	36 0	22 6	12 0	18 0	180	1800
Royal Whole Can.	12 0	8000	8 0	7 4	58 0	24 0	14 6	32 8	185	1850

To this Table I thought it necessary to adjoin Mr. *Anderson's*; which, I question not, is much truer: As being the Result of more Experience, and more Skill in this kind of Mathematical Learning. However, the Differences of the Ranges are so great, that it is worth Examining which is the Trueſt.

Mr. Anderson's TABLE of the Names, Diameters, Chases, Requisites of Powder, Comparative Forces, and Greatest Ranges, to Eight Degrees of Elevation, of Ten several Pieces of Cannon, Experimentally and Mathematically demonstrated.

Names of the Pieces.	Length of the Chase.	Diameter of the Bore.		Requisite of Powder.		Greatest Range.	Comparative Force.
	Feet.	Inches.		lb.	3.	Paces.	
1 A Rabbinet	3	1	75	5		3769	38
2 A Falconet	4	2		9		4398	61
3 A Falcon	6	2	75	1	10	4797	161
4 A Minion	8	3		2	10	5864	238
5 A Saker	9	3	5	4		5654	371
6 A Demi-Culverin	10	4		7	5	4886	733
7 A Culverin	11	5		10		4837	1000
8 A Demi-Cannon	11	6		14	6	4031	1575
9 A Whole Cannon	12	7		21	5	3769	2422
10 A Cannon-Royal	12	8		27	14	3298	3382

The Strength and Serviceableness of a Piece of Ordnance, consists very much in the Thickness of the Metal, especially about its Chamber and Breech, and this is called its *Fortification*.

And of this there are three degrees both for Cannons and Culverines.

1. Such as are ordinarily fortified, are called *Legitimate Pieces*.

2. Those whose Fortification is lessened, are called *Bastard Pieces*.

3. There are some that are doubly fortified, which are called *Double-fortified*, or *Extraordinary Pieces*.

The Fortification of a Gun is reckoned from the Thickness of the Metal at the Touch-hole, at the Trunnions and at the Muzzle, in proportion to the Diameter of the Bore.

The *Doubly-fortified Pieces*, are a full Diameter of the Bore in Thickness at the Touch-hole, $\frac{1}{8}$ of it at the Trunnions, at $\frac{1}{4}$ at their Muzzle.

The *Lessened Cannons* have but $\frac{1}{2}$ or $\frac{1}{3}$ of the Diameter of their Bore, in Thickness at the Touch-hole, $\frac{1}{4}$ at the Trunnions, $\frac{1}{2}$ at the Muzzle.

All the *Double-fortified Culverines*, and all lesser Pieces of that kind, have a Diameter and $\frac{1}{4}$ at the Touch-hole, $\frac{1}{2}$ at the Trunnions, and $\frac{3}{4}$ at the Muzzle. And the Ordinary Fortified Culverines are every way as your Double-Fortified Cannon; and the Lessened Culverines are as the Ordinary Cannons, in all respects.

The Ordinary Fortified Cannons have $\frac{7}{8}$ at the Touch-hole, $\frac{1}{2}$ at the Trunnions, and $\frac{1}{4}$ at the Muzzle.

The Famous Galileus was the first who proved the Line of a Bullet to be in the Curve of a Parabola (abstracting from the Line of Impulse, and the Resistance of the Medium, as I judge) as you may find in his Fourth Dialogue; where also he gives a Table of Horizontal Ranges. *Discorsi e Dimostrazioni Matematiche*, p. 280, 281.

And his Scholar *Torricellius*, in his Second Book *De Motu Projectorum*, brings the Horizontal Ranges to the Table of Sines, and the greatest Altitudes to the Versed Sines: That is, he proves, That all Ranges on the Plane of the Horizon, are in proportion to one another, as the Sines of the Double Angles of the Elevation of their Lines of Direction. And for the Time of the Continuance of any Shot above the Horizon, he shews in *Prop. 18. Book 2.* That as Radius is to the greatest Duration (i. e. when the Elevation of the Piece is 90 degrees, or when it stands perpendicular): so is the Sine of any other Elevation of the Gun, to the Time of the Range of that Shot.

After this, one *Robert Anderson*, by Trade a Weaver, but peculiarly skilful both in the Application of Mathematicks to this Matter, and also prodigiously industrious and accurate in making Trials with both Guns and Mortars, which he procured to be cast and fitted at his own Charge: This Man, I say, in the Year 1674. published a Book of the *Genuine Use and Effects of the Gun*, together with Tables of the Altitudes of Projections above the Horizon, &c. Calculated by Mr. Street; in which, in Fifty Propositions, he shews:

1. How from any Shot of a Great Gun, or any Piece, howsoever made, to find the greatest Random of that Piece: And also to strike any Place upon either Ascents or Descents within the Reach of the Piece.

2. He shews the Relations of all Guns of the same kind among themselves; and thence the Dimensions and requisite Powder of any Piece with a Range answerable to any Degree being given: He gives Rules to find the requisite Powder of any other Piece, and to strike any Place at demand within Reach, its Dimensions being also given.

COROLLARY.

Hence it follows, That half the Parameter is the greatest Random, and that happens at the Elevation of 45 Degrees, the Sine of whose double is Radius: Likewise that the Ranges equally distant above and below 45 are equal, as are the Sines of all double Arches to the Sines of their double Complements.

PROP. II.

The Altitudes of Projections made with the same Velocity, at several Elevations, are as the Versed Sines of the double Angles of Elevations.

As e is to s :: so is $\frac{p s s}{r r} = GB$ to $\frac{p s s}{r r} = BF$, and $UK = RU = \frac{BF}{4}$, the Altitude of the Projection $= \frac{p s s}{4 r^2}$. Now by the foregoing Lemma $\frac{2 s s}{r} =$ to the Versed Sine of the double Angle, and therefore it will be as Radius to Versed Sine of double the Angle $FG B$, so an 8th of the Parameter to the height of the Projection UK ; and so these Heights at several Elevations, are as the said Versed Sines, Q. E. D.

COROLLARY.

From hence it is plain, that the greatest Altitude of the Perpendicular Projection is a 4th of a Parameter, or half the greatest Horizontal Range; the Versed Sign of 180 Degrees, being $= 2r$.

PROP. III.

The Lines $G F$, or Times of the Flight of a Project cast with the same Degree of Velocity at different Elevations, are as the Signs of the Elevations.

As c is to r :: so is $\frac{p s c}{r r} = GB$ by the 6th Proposition to $\frac{p s}{r} = GF$; that is, as Radius to Sine of Elevation, so the Parameter to the Line GF ; so the Lines GF are as the Sines of Elevation, and the Times are proportional to those Lines: Wherefore the Times are as the Sines of the Elevation: Ergo constat propositio.

PROP. IV.

Problem. A Projection being made as you please, having the Distance and Altitude, or Descent of an Object through which the Project passes, together with the Angle of Elevation, with the Line of Direction; to find the Parameter and Velocity that is (in Fig. 2.) having the Angle $FG B$, GM , and MX .

SOLUTION.

As Radius to Secant of $FG B$, so GM the Distance given, to GL ; and as Radius to Tangent of $FG B$, so GM to LM . Then $LM = MX$ in Heights, or $+MX$ in Descents; or else $MX = ML$, if the Direction be below the Horizontal Line, is the Fall in the Time that the direct Impulse given in G , would have carried the Project from G to $L = LX = GY$. Then by reason of the Parabola, as LX or GY is to GL or YX :: so is GL to the Parameter sought.

To find the Velocity of the Impulse, by Prop. 2. and 4, find the Time in Seconds that a Body would fall the Space LX , and by that dividing the Line GL , the Quote will be the Velocity, or Space moved in a Second sought, which is always a mean Proportional between the Parameter, and 16 Feet 1 Inch.

PROP. V.

Problem 2. Having the Parameter, Horizontal Distance, and Height or Descent of an Object, to find the Elevations of the Line of Directions necessary to hit the given Object; that is, Having GM , MX , and the greatest Random equal to half the Parameter; to find the Angles $FG B$.

Let the Tangent of the Angle sought be $= t$, the Horizontal Distance $GM = b$, the Altitude of the Object $MX = h$, the Parameter $= p$; and Radius $= r$, and it will be as r to t , so b to $\frac{t b}{r} = ML$, and $\frac{t b}{r} + b$ in Ascents

$= LX$, and $\frac{p t b}{r} + p b = GL \square = + Y \square$ by reason of the Parab. but $b b + \frac{t t b b}{r r} = GL$

$\square. 47. 1$ Euclid. Wherefore $\frac{p t b}{r} + p b =$

$b b + \frac{t t b b}{r r}$ which Equation transposed, is $t t b b = \frac{p t b}{r} + p b - b b$, divided by $b b$

is $\frac{t t}{r r} = \frac{p t}{b r} + \frac{p b}{b b} - 1$. This Equation shews the Question to have two Answers, and the Roots thereof are $\frac{t}{r} = \frac{p}{2 b} + \sqrt{\frac{p p + 4 p b}{4 b b}} - 1$.

From which I derive the following Rule.

Divide half the Parameter by the Horizontal Distance, and keep the Quote, viz. $\frac{p}{2 b}$, then say, As Square of the Distance given to the half Parameter, so half Parameter $+ double$ Height to the Square of the Secant $= \frac{p p + 4 p b}{4 b b}$ the Tangent answering to that Secant, will be $\sqrt{\frac{p p + 4 p b}{4 b b}} - 1$ or $r r$: So then the Sum

and

too deep in the Ground, to do all that Damage they might, if they came more Oblique, and broke upon or near the Surface of the Earth; which is a thing acknowledged by the Besieged in all Towns, who unpave their Streets to let the Bombs bury themselves, and thereby stifle the force of their Splinters.

A Second Convenience is, That at the extrem Elevation, the Gunner is not obliged to be so Curious in the Direction of his Piece, but it will suffice to be within a Degree or two of the Truth; whereas in the other Method of Shooting he ought to be very curious.

But a Third, and no less considerable Advantage is, in the saving of the King's Powder, which in so great, and so numerous Discharges, as we have lately seen, must needs amount to a considerable Value.

And for Sea Mortars, it is scarce practicable otherwise to use them, where the Agitation of the Sea continually changes the Direction of the Mortar, and would render the Shot very uncertain, were it not that they are placed about 45 Degrees of Elevation, where several Degrees above or under, make very little difference in the Effect.

In Numb. 179. of these *Transactions*, I considered and demonstrated all the Propositions relating to the Motion of the *Projectiles*, and gave a Solution to this Problem, viz. To hit an Object above or below the Horizontal Line, with the greatest Certainty and least Force, as may be seen in that *Transaction*, p. 16, 17. That is, That the Horizontal Distance of the Object being put $= b$, and the perpendicular Height $= h$, the Charge requisite to strike the Object with the greatest Advantage, was that which with an Elevation of 45 Degrees, would cast the Shot on the Horizontal Line, to the Distance of $\sqrt{bb + hh} + h$, when the Object was above the Horizon; or if it were below it, the Charge must be lesser, so as to reach on the Horizon, at 45 Degrees Elevation, no greater a Distance than $\sqrt{bb + hh} - h$; that is in the one Case, the Sum of the Hypothenusal Distance of the Object from the Gun, and the Perpendicular Height thereof above the Gun; and in the other Case, when the Object is below the Horizon, the Difference of the same, per 47. 1. Euclid.

And I then shewed how to find the Elevation proper for the Gun so charged, viz. As the Horizontal Distance of the Object, to the Sum or Difference of the Hypothenusal Distance, and Perpendicular Height :: So Radius to the Tangent of the Elevation sought. But I was not at that time aware that the aforesaid Elevation did constantly bisect the Angle between the Perpendicular and the Object, as is demonstrated from the Difference and Sum of the Tangent and Secant of any Arch, being always equal to the Tangent and Co-tangent of the half Complement thereof to a Quadrant.

Having discovered this, I think nothing can be more compendious, or bids fairer to compleat the Art of Gunnery, it being as easie to shoot with a Mortar at any Object on Demand, as if it were on the Level: Neither is there need of any Computation, but only simply laying the Gun to pass, in the middle Line between the Zenith and the Object, and giving it its due Charge. Nor is

there any great need of Instruments for this Purpose: For if the Muzzle of the Mortar be turned truly Square to the Bore of the Piece, as it usually is, or ought to be, a piece of Looking-glass Plate applied parallel to the Muzzle, will by its Reflection give the true Position of the Piece; the Bombardeer having no more to do, but to look perpendicularly down on the Looking-glass, alongft a small Thread with a Plummer, and to raise or depress the Elevation of the Piece, till the Object appear reflected on the some Point of the Speculum, on which the Plummer falls; for the Angle of Incidence and Reflection being equal, in this case a Line at Right Angles, to the Speculum, as is the Axis of the Chafe of the Piece, will bisect the Angle between the Perpendicular and the Object, according as our Proposition requires. So that it only remains by good and valid Experiments to be assured of the force of Gun-powder. How to make and conserve it equal, and to know the Effect thereof in each Piece; that is, how far differing Charges will cast the same Shot out of it; which may most conveniently be engraven on the outside thereof, as a standing Direction to all Gunners, who shall from thenceforward have occasion to use that Piece: And were this Matter well ascertained, it might be worth the While to make all Mortars of the like Diameter, as near as may be alike in length of Chafe, Weight, Chamber, and all other Circumstances.

This Discovery that the utmost Range on an inclined Plane is, when the Axis of the Piece makes equal Angles with the Perpendicular and the Object, compared with what I have demonstrated of the same Problem in the aforesaid Number 179, does lead to and discover two very ready Theorems; the one to find the greatest Horizontal Range at 45 Degrees Elevation by any Shot made upon any inclined Plain with any Elevation of the Piece whatsoever: And the other to find the Elevations proper to strike a given Object with any Force greater than what suffices to reach it with the aforesaid middle Elevation. Both which being performed by one Single Proportion, may be very serviceable to such as are concerned in the Practice of Gunnery, but are unwilling to trouble themselves with tedious and difficult Rules.

The Two Propositions are, these.

P R O P. I.

A Shot being made on an inclined Plane, having the Horizontal Distance of the Object it strikes, with the Elevation of the Piece, and the Angle at the Gun between the Object and the Perpendicular: To find the greatest Horizontal Range of that Piece, laden with the same Charge; that is, half the Latus Rectum of all the Parabole, made with the same Impercus.

R U L E.

Take half the Distance of the Object from the Nadir, and take the Difference of the given Elevation from that half; the Versed Sine of that Difference subtract from the Versed Sine of the Distance of the Object from the Zenith: Then shall the Difference of those Versed Sines be to the Sine of the Distance of the Object from the

the Zenith, as the Horizontal Distance of the Object struck, to the greatest Horizontal Range at 45 Degrees.

PROP. II.

Having the greatest Horizontal Range of a Gun, the Horizontal Distance, and the Angle of Inclination of an Object to the Perpendicular, to find the two Elevations necessary to strike that Object.

R U L E.

Halve the Distance of the Object from the Nadir, this half is always equal to the half Sum of the two Elevations we seek. Then say, As the greatest Horizontal Range is to the Horizontal Distance of the Object : So is the Sine of the Angle of Inclination or Distance of the Object from the Perpendicular, to a fourth Proportional ; which Fourth being subtracted from the Versed Sine of the Distance of the Object from the Zenith, leaves the Versed Sine of half the Difference of the Elevation sought ; which Elevations are therefore had by adding and subtracting that half Difference to and from the aforesaid half Sum.

I shall not need to speak of the Facility of these Solutions : I shall only observe, That they are both general, without Exception or Caution, and derived from the Knowledge that these two Elevations are equi-distant above and below the Line, bisecting the Angle between the Object and the Zenith.

ORDONANCE, in Architecture, is the giving to all the Parts of an Edifice that just Quantity and Dimension which they ought to have, according to the Model.

OREXIS, is the Natural Appetite of Meat, which proceeds from an Acid Ferment in the Ventricle that comes from the *Caliac* Arteries, with which the nervous Tunick of the Stomach and its Nerves are extraordinarily moved to cover Nourishment. *Blanchard*.

ORGANICAL Part, is that Part of an Animal or Vegetable Body, which is designed for the performing some particular Action : Whereas some Parts are *Non organical* ; which have no particular Action, but rather some Use in the Oeconomy of the Whole.

ORGANS, the Parts of an Animal Body, fitted as Instruments to discharge any particular Office or Function. Thus the Organ of Sight is the Eye with all its Parts ; the Organ of Hearing is the Ear, &c. Therefore by *Organical Parts* are meant the Substantial Parts or Members of the Body, appointed to perform any particular Function or Action.

ORGANUM, or *Organon*, the Name or Title that *Aristotle* gave to his Book of Logic.

ORGASMUS, is an *Impetus* and quick Motion of Blood or Spirits ; as when the Animal Spirits rush violently into the Nerves.

ORIENT, is the East Quarter of the *Horizon*, or is that Part of the *Horizon* where the *Ecliptick*, or the Sun therein, ascends into the upper Hemisphere ; and therefore, according to some Writers way of Expression, the

Estival ORIENT, is that Point of the *Horizon* where the Sun rises, when he enters into *Cancer*.

Equinoctial ORIENT, is that Point of the *Horizon* which the Sun rises upon, when he enters into *Aries* or *Libra*.

ORIENTAL, in Astronomy : A Planet is said to be *Oriental*, when it rises in the Morning before the Sun.

ORIFICE, the Mouth, Entry, or Brim of any thing, more-especially that of a Wound, Vein, Tube, &c.

ORIGINAL Equations. A Term used by *Harriot* in his Algebra ; see *Quadratick Equations*.

ORIGINALIA, in the Treasurer's Remembrancer's Office in the *Exchequer*, are Records or Transcripts sent thither out of the *Chancery*, and are distinguished from *Recorda*, which contain the Judgments and Pleadings in Suits tried before the Barons of that Court.

ORILLON, in Fortification, is a small Round- ing of Earth lined with a Wall, which is raised on the Shoulder of those Bastions that have Caisements, to cover the Cannon in the Retired Flank, and prevent their being dismounted by the Enemy.

There are also other sorts of *Orillons*, properly called *Shoulderings* ; which are almost of a Square Figure : They are also called *Epaulements*.

ORION, a Southern Constellation, consisting of 39 Stars.

ORGUES, in Fortification, are many Harquebusses link'd together, or divers Musket-Barrels laid in a row, within one Wooden Stock, so that they may be discharged either all at once, or separately. They are made use of to defend Breaches and other Posts that are attack'd.

This Term is also appropriated to certain long and thick pieces of Timber, arm'd with Iron Plates at the ends, and separated one from another. They are hung with Cords over the Gates of a Town or Fortrefs, and in Case of Surprise, let fall perpendicularly ; by which means the Passage is stop'd, so that the Enemy cannot easily remove or hoist up all the Wooden Bars with a Leaver, or any other Machine set under them : On which account these *Orgues* are to be prefer'd before *Hermes* or *Portcullices*, because the Pieces whereof the latter consist are join'd together ; so that when any Part is hung or heaved up, the whole Machine is likewise removed. These *Orgues* therefore are much better than *Portcullices*.



ORLE, is an Ordinary in Heraldry, almost of the Figure of an *Inescutcheon*, only it is voided, so that the Field appears through ; Thus : He beareth *Or*, an *Orle Azure*, by the Name of *Bertram*. Whenever an *Orle* is flowered, it is called a *Tressure* ; and if there be two of them, a *Double Tressure*.

Sometimes an *Orle* consists of three pieces one within another. Also if a Round of *Martlets*, *Cinquefoils*, *Escallop-shells*, &c. are placed about any Ordinary, 'tis called an *Orle* of *Martlets*, *Cinquefoils*, &c.

ORLE, a Term in Architecture ; the same with *Plinth*, which see.

ORLOPE, properly the Spare-Deck in a great Ship, reaching from the Main-mast to the Mizen ; and in a Three-Deck'd Ship the Second and Lowest Deck are sometimes called *Orlopes*.

ORNAMENTS, in Architecture, are the *Architraves*, *Frizes*, and *Cornices* of the several Orders. But there are also many Ornaments frequent-

ly carved in the Mouldings, and on all other Members; as divers sorts of *Leaves, Chanellings, Wreaths, Ovals, Chaplets, Tresses, Festoons, Flowers, Roses, &c.* The Ornaments of the Columns the French call *Oeufs*.

ORNITHOLOGY, is a Description of the several Natures and Kinds of Birds.

OROBIDES, is a subsiding in Urine, like to a kind of Pulse called *Vetches*. *Blanchard*.

ORTEIL, a Term in Fortification; the same with *Berne*, which see.

ORTHODROMIQUES, is the Art of sailing in the Ark of some great Circle: For the Ark of every great Circle is *orthodromia*, the shortest straight Distance between any two Points on the Surface of the Globe.

ORTHOGRAPHY, in *Grammar*, is writing and spelling any Language truly, according to its just Etymologies and Proprieties.

ORTHOGRAPY, in *Mathematicks*, is the true Delineation of the fore-right Plain of any Object.

In *Architecture*, 'tis taken for the Model, Platform, and Delineation of the Front of a House that is to be built and contrived according to the Rules of Geometry; according to which Pattern, the whole Fabrick is erected and finished.

In *Perspective*, the *Orthography* of any Body, or Building, is the foreright side of any Plane; that is, the Side or Plane that lies parallel to a straight Line, that may be imagined to pass thro' the outward Convex Points of the Eyes, continued to a convenient Length. The Word *Orthography* is used by *Lamy* and Others in the same Sense.

In *Fortification*, it is the Profile or Representation of a Fortrefs, made after such a manner, that the Length, Breadth and Height of its several Parts may be discovered.

ORTHOGRAPHICAL Projection of the Sphere, is the drawing the Superficies of the Sphere on a Plane which cutteth it in the middle, the Eye being placed at an infinite Distance vertically to one of the Hemispheres; then a Right Line extended from the Eye to any assigned Point in the Surface of that Hemisphere, shall project the assigned Point upon the Plane; and the Distance upon the Plane from the Apex, or top of the Hemisphere to the projected Point, is equal to the Sine of the Ark, from the Vertex of the Hemisphere to the assigned Point, the Radius being the Semi-diameter of the Sphere. This Projection is also called the *Analemma*, which see.

ORTHOAGONIAL, the same with *Right-angled*; and when referred to a Plain Figure, supposes one Leg or Side to stand perpendicular to the other: And when it is spoken of Solids, it supposes their Axis to be perpendicular to the Plane of the Horizon.

ORTHOPNOEA, is an ill Respiration, when the Person affected cannot breathe but with his Neck erect.

OS, a Bone, is an hard, dry, and cold Substance, consisting especially of earthy and saline Particles; which Particles, saith *Dr. Havers*, being in their several Series united at their Extremities, form Strings; and those Strings united make distinct Plates, which lying one above another, constitute the whole Thickness of the Bone.

The Bones in an Human Body, are designed for the upholding of the Body, to render its Mo-

tion easie, and for a Fence for several Parts. Some make the Number of the Bones to be 249, others commonly 304, and others as many as the Days of the Year; yet the Number of them is uncertain, because the Bones of Infants differ from those of Adult Persons; also, because the Bones called *Sesamoides*, (see them in their proper Place) and the Teeth, are not determined to a certain Number in Old Men and Adult Persons. They are of different Shapes; some are round, others plain, acute, obtuse, hollow, spongy, solid, oblong, triangular, &c. If you would find any particular Bone, see the Word that distinguishes it; as, for *Os frontis*, or *Coronale*; see *Frontis Os*, or *Coronale*.

OS Calcis. See *Calcaneus*.

OSCILLATION. If a Ball be hung at the end of a String or Wire, and that Wire or String hang on a Pin fastened above, so that the Ball may swing or play freely on that Pin, it is called a *Pendulum*, and the Pin is the Centre of Suspension: But if you imagine the Pin to be the Centre of a Circle, whose Circumference shall divide the Ball or Bob into two equal Parts, the middle Point of the Ark, so dividing the Ball, is called the Centre of Oscillation. If the Bob be of any other Figure but orbicular, the Centre of Gravity of it will be the Centre of Oscillation.

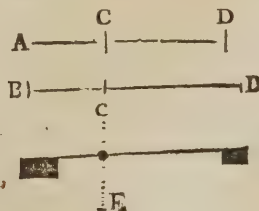
N. B. The shorter the Oscillations or Swings are, the truer will the *Pendulum* measure Time; or the more *Isochrone* will the Vibrations be, as some love to express themselves.

To find the Centre of Oscillation exactly, in order to adjust the Royal Pendulum of a Clock, *Mr. Hugen* gives this Proportion, (*Horol. Oscillat. p. 141.*)

As the Length of the String from the Point of Suspension, to the Centre of a Ball or Bob: is to the Semi-diameter of that Ball or Bob:: so is that Semi-diameter to a Fourth Number.

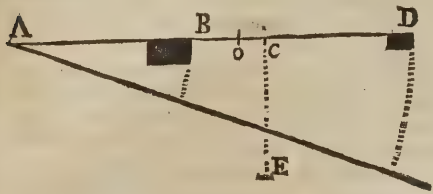
Add $\frac{3}{4}$ of that Fourth Number to the former Length, and you have the Centre of Oscillation.

But this Term, the Centre of Oscillation is often in *Mechanicks* taken in a more large and comprehensive Sense. As suppose there be a *Libra*, as B D, having the Weights B and D,



hanging at its ends by their Centres of Gravity B and D; and let the Point C be the *Hypomochlion*, *Fulcrum* or Prop which is supposed to support the *Libra* in the common Centre of Gravity C, belonging to the two Bodies B and D; then will those Weights be in *Equilibrio*. Let this *Libra*, with the Weights B and D hanging at it, descend perpendicular to the Horizon all together, and still retain a Parallelism to itself

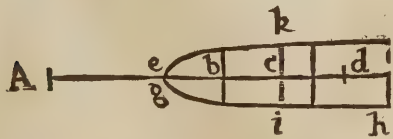
self in its first Situation; and as it thus moves, let it meet with an Obstacle, as E, which shall strike it in C, the above-mentioned common Centre of Gravity: Then because the Descent of the *Libra* was by a parallel Motion, the Points B and D will have acquired equal Velocities; and consequently the Weights hanging at such Points will also gain equal Velocities; and therefore if the *Libra* strike upon E, the *Æquilibrium* must continue the same as before, that is, will not oscillate or swing any way, but keep at Right Angles with the Line CE: Wherefore C is both the common Centre of Gravity, and also of Oscillation.



But supposing the *Libra* to turn round the Centre A, or to swing on it like a *Pendulum*, with its Weights B and D affixed to it, as before: In this Case will the Weights B and D acquire each a Degree of Velocity, proportionable to their respective Distances from the Centre. And consequently if *o* (suppose) had been their common Centre of Gravity, before the new Rotation of the *Libra* round A, it cannot now be the Point on which the Revolving Bodies B and D will poize, or be in *Æquilibrio*: That is, the Point *o* cannot be the Centre of Oscillation.

For since *o* is supposed to be the common Centre of Gravity, therefore the Moment of B O \times B, must be equal to the Moment of D O multiplied by D: But since the Velocity of B is to that of D, as A B is to A D; therefore the Compound Moment of B \times B O \times A B cannot be equal to the Compound Moment of D \times D O \times A D; and consequently there cannot be an *Æquilibrium* about the Point *o*: Wherefore if an *Obex* or Obstacle should meet with the *Libra* in the Point *o*, the *Libra* would oscillate or dip towards the Parts of D, because that *Momentum* is the greater of the two. But the true Centre of Oscillation will be a Point as C, taken so, that the Moment of B \times B C \times A B, shall be equal to the Moment of B \times D C \times A D. That is, if A D . A B :: B \times B C . D \times D C, then will C be the true Centre of Oscillation; and if the Revolving *Libra* should be supposed to meet with an *Obex*, it would not oscillate upon it.

In like manner, if instead of a *Libra* burden'd with two Weights, as above, we conceive any plain or solid Figure to revolve about the Centre A, its Centre of Oscillation is to be determin'd by the same Principle.



Thro' the Point C of the Revolving Figure taken in the Axis *e d*, let the Line *k i* be drawn, dividing the Figure into two Parts, *e k i g*, and *k f b i*; the Centres of Gravity of which Parts

suppose to be at *b* and *d*: Then if the Compound Moment of *i e*, *k c* \times *b c* \times *A b* = *k f b i* \times *c d* \times *A d*: for the same Reason as before, C will be the Centre of Oscillation.

This I had from Mr. Humphry Ditton.

OSCITATION, Yawning, is a certain light Convulsive Motion of those Muscles which open the lower Jaw of the Face. Some think that Excrementitious and Halituous Matter, which irritates the neighbouring Parts, is expelled by this Action of Yawning.

OScula, are the Openings of Vessels in an Animal Body, at their ends.

OSculATORIUS Musculus. See *Orbicularis*.

OS Mali. See *Zygoma*.

OS Unguis. See *Unguis Os*.

OS Occipitis. See *Occipitis Os*.

OS Palati. See *Palati Os*.

OSSA Parietalia. See *Parietalia Offa*.

OSSA Temporum. See *Temporum Offa*.

OS Sphenoides. See *Sphenoides*.

OSSICULUM, among the Botanists, is the Stone of a Plum, Cherry, or such like Fruit.

OSTENSIVE Demonstrations, are such as plainly and directly demonstrate the Truth of any Proposition; in which they are distinguished from *Apogogical* ones, or *Deductiones ad Absurdum*, five *ad Impossibile*, which prove the Truth proposed, by demonstrating the Absurdity or Impossibility of asserting the contrary.

OSTENSIVE Demonstrations, are of two sorts: Some of which barely (but directly) prove the Thing to be, which they call *veri*; and Others demonstrate the Thing from its Cause, Nature, or Essential Properties, and these are called in the Schools *divini*.

OSTEOLOGIA, is a Description of Bones.

OSTOCOPI, are Pains in the Bones, or rather in the Membranes and Nerves about the Bones: For Bones, as such, are insensible. *Blanchard*.

OTACOUSTICKS, are Instruments which help or improve the Sense of Hearing. See *Acoustica*.

OTALGIA, is a Pain in the Ears, whence-soever it proceeds.

OTENCHYTA, an Auricular Clyster. *Celsus* calls it *Oegin*, a little Syringe or Squirt which injects Medicines into the Ears.

OTICA, are Medicines against Distempers in the Ears.

OVAL, in Architecture, the same with *Echinus*. Some write it *Obo*, because of its Figure, being like an Egg. It is placed in the Mouldings of the Cornices, for Ornament; and in a Pillar it is placed next the *Abacus*.

OVAL Figure, in Geometry, is a Figure bounded by a regular Curve Line returning into its self; but of its two Diameters cutting each other at Right Angles in the Centre; one is longer than the other, in which it differs from the *Circle*. See *Ellipsis*.

OVAL Window, one of the Holes in the Hollow of the Ear, opening pretty wide into the *Labyrinth*; the other being called the *Round Window*.

OVARIA, are the Testicles of Females, and are so called, because they resemble and have the same Use as the Lathers or Collections of Eggs in the Bodies of Fowls.

OVEL

OVELTY of *Services*, in Law, signifies Equality of *Services*; as when the Tenant Paravail owes as much to the Mesne, as the Mesne does to the Lord Paramount.

OVER-Rake. When a Ship, riding at Anchor, doth so over-beat her self into a Head Sea, that she is wash'd by the Waves breaking in upon her, then they say the Waves do *Over-rake her*.

OVERT-ACT, a Term in Law, signifying an Open ACT, which may be manifestly proved.

OVIDUCTUS, the same with *Tubā Fallopiana*.

OVIPAROUS Animals, are such as lay Eggs.

OUTACoustacon, an Ear-pipe to augment Hearing.

OUTLAW, signifies one deprived of the Benefit of the Law, and out of the King's Protection.

OUTLAWRY, is the Loss of the Benefit of a Subject, that is, of the King's Protection. See *Outlawry*.

OUTLICKEr, in a Ship, is a small piece of Timber three or four Yards long, as Occasion serves, and is made fast to the top of the Poop, and so stands right out a-stern: At the outmoſt end of it is a Hole, into which the standing part of the Sheet is reeved and made fast through the Block of the Sheet; and then again reeved thro' another Block, which is seized to this Outlicker, hard by the end of it. This is seldom used in Men of War, or in great Ships; and whenever it is made use of, it is because the Mizen-mast is placed so far aft, that there is not room enough within board to hale the Sheet flat.

OUTRIDERS, in Law, are Bailiffs Errant employed by the Sheriffs, or their Deputies, to ride to the farthest Places of their Counties or Hundreds, with the more speed to Summon such as they thought good to their County or Hundred Courts.

OUTWARD Flanking-Angle, or the *Angle of the Tenaille*, is comprehended by the two Flanking Lines of Defence.

OUT-Works, in Fortification, are all sorts of Works which are rais'd without the Inclosure of a Place, and serve for its better Defence, and to cover it from the Enemy, in the Plain without; as, *Ravelins, Half-moons, Horn-works, Crown-works, Counter-guards, Tenailles, &c.*

It is a general Rule in all Out-works, that if there be several of them one before another to cover one and the self-same *Tenaille* of a Place, the nearer ones must gradually, and one after another, command those which are farthest ad-

vanced out into the Campain; that is, must have higher Ramparts, that so they may over-look and fire upon the Besiegers, when they are Masters of the more outward Works.

The *Gorges* also of all Outworks must always be plain, and without Parapets; lest, when taken, they should serve to secure the Besiegers against the Fire of the Retiring Besieged; wherefore the *Gorges* of Out-works are only Pallisado'd, to prevent a Surprise.

Ouverture, is a kind of Musick, usually played at the Opening or Beginning of an Opera; it commonly ends with a *Fugue*.

OVUM, by some Writers, is a Name given to a certain Pain in the Head, affecting one particular Spot, no bigger than the End of an Egg; whence the Name.

OWELTY, in Law, is when there is Lord, Mesne, and Tenant; and the Tenant holds of the Mesne by the same Service that the Mesne holds over the Lord above him: This is called *Owely of Services*. See *Owely*.

OXELEUM, is a Mixture of Vinegar and Oil.

OXYCRATUM, is a Mixture of Vinegar with Water, called *Pusca* or *Posca*.

OXYDERCICA, are Medicines which quicken the Sight.

OXYGALE, is Sowre Milk.

OXYGONE, the same with an *Acute-Angled Triangle*; which see. And in the General,

OXYGONIAL, is *Acute-Angular*.

OXYMEL, is a Composition of Vinegar and Honey, like a Syrup.

OXYREGMIA, is an acid sowre Belch from the Stomach.

OXYRHODINUM, is Vinegar of Roses mix'd with Rose-water.

OYER and *Terminer*, in Law, is a Commission especially granted to some Eminent Persons for the hearing and determining one or more Causes: It is the first and largest of the Commissions, by which the Judges of Assize do sit in their several Circuits.

OYER de Record, is a Petition made in Court, That the Judges, for better Proofs sake, will be pleased to hear or look upon any *Record*. So when an Action is brought upon an Obligation, the Defendant may pray *Oyer* of the Bond; or if Executors sue for any one, the Party sued may demand *Oyer* of the Testament.

OZOENA, is an old stinking Ulcer in the inside of the Nostrils, taking its Name from the Fulsonness of its Smell.

P A C

PACHUNTICK Medicines (from *παχυνσις*) Thick, Dense, &c. are such as are of a thickning Nature, and withal cold; these when mix'd with a thin Juice, by joining the Parts together stiffen it, and make it of a more Dense, and firm Composition: Such as Bole-Armoniack, Almonds, Poppies, Water-Lilies, &c. *Blanchard.*

PAINE fort & dure, in Law it signifies an especial Punishment for him that being Arraigned of Felony, refuses to put himself upon the ordinary Trial of God and his Country, and thereby stands Mute by the Interpretation of the Law.

And is thus described by *Stamford.*

"He shall be sent back to the Prison, whence he came, and laid in some low dark House, where he shall lie Naked on the Earth, without any Litter, Ruffes, or other Cloathing, and without any Rayment about him, but only something to cover his Privy Members: And he shall lie upon his Back, with his Head covered and his Feet; and one Arm shall be drawn to one quarter of the House with a Cord, and the other Arm to another quarter, and his Legs used in the same manner; let there be laid upon his Body, Iron and Stone as much as he may bear, or more: And the next Day following he shall have three Morfels of Barly-bread, without Drink; and the second Day he shall have Drink three times, as much at each time as he can Drink of the Water next unto the Prison, except it be running Water, without any Bread: And this shall be his Diet till he Die."

This sort of Punishment, called by the Law *Paine forte & dure*, is that which is vulgarly called *Pressing to Death.*

PALATUM, the Palate, is the upper part of the Mouth, which because it resembles the Roof of an House, is thence called the *Roof of the Mouth.*

PALATI Os, is a small Bone almost square, it makes the posterior part of the Roof of the Mouth: It is joined to that part of the Os *Maxillare*, which makes the fore-part of the Palate; it is also joined to its Fellow, and the *Processus Pterigoides*. It has a small Hole, thro' which a Branch of the fifth pair of Nerves goes to the Membrane of the Palate.

PALINDROME, is a Disease into which one relapses. *Blanchard.*



PALE, one of the Eight Honourable Ordinaries in Heraldry, containing the third part of the Escutcheon, thus:

He beareth *Gules, a Pale Or.*

P A L



PALL, the *Heralds* have a kind of Cross, which they call by this Name, and they describe it thus:

He beareth *Gules a Cross Pall Argent.*

PALLET, is the Moiety, or half of the *Pale*, and must never be charged with any thing either Quick or Dead; neither can it be divided into two equal parts, but it may into four, for one fourth part of the *Pallate*, or $\frac{1}{4}$ part of the *Pale*, is called an *Endorse*.

If the *Pale* be upon any Beast, they say the Beast is *Debrused with the Pale*: But if the Beast be upon the *Pale*, they say he is *Supported of the Pale*.

Pallets also is a Term which belongs to the *Ballance* of a Watch or Movement. See *Ballance*.

PALLET is a Room within the Hold of a Ship, closely parted from it, in which by laying some Pigs of Lead, &c. a Ship may be sufficiently Ballasted, without losing room in the Hold; which therefore will serve for Stowing the more Goods.

PALLIATION of a Disease, or a *Palliative Cure*, is a Method which helps (as much as is possible) incurable Diseases by the Application of prevent Remedies.

PALLIER, a Landing-place in a Stair-Case or a Step, which being much broader than the others, serves to rest upon.

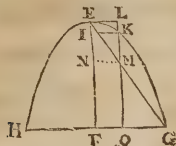
PALLISADOES, or *Pallisades* in Fortification, are strong Wooden sharp-pointed Stakes, six or seven Inches square, eight Foot long, of which three Foot is in the Ground, set up half a Foot sometimes one above another, with a cross piece of Timber that binds them together: Some of these are also sometimes arm'd with two or three Iron-Spikes.

These *Pallisadoes* are usually fixed in the void Spaces without the *Glacis*, near the Bastions and Curtains; and in the Avenues of all such Posts as are liable to be surprized by the Enemy, or carried by Assault. Sometimes they are driven downright in the Ground, and sometimes stand at an Acute Angle towards the Enemy, that if they should throw Cords about them to pull them up, they may slip off again.

Pallisadoes are always planted on the *Berne* of Bastions, and at the *Gorges* of Half-Moons and other Out-works: They also *Pallisade* usually the Bottom of the Ditch; and to be sure, the *Parapet* of the *Covert way*: And tho' sometimes they have placed these *Pallisadoes* three Foot from the said *Parapet* outwards towards the Campaign, yet of late they have been planted in the very middle of the *Covert way*: All *Pallisadoes* should stand so close, as to admit between them only the Muzzle of a Musquet, or a Pike.

PALMARIS *Longus*, is a Muscle of the Palm of the Hand, which has an Acute Beginning from the Internal Exuberance of the Os *Humeri*; and soon becoming a Fleishy Belly, and contract-

ing



For let EF be called ib , as EI was before called eb : Then the Parameter being $\frac{ooo}{b}$

the Square of FG the Ordinate, will be equal to the Parameter multiplied by ib the *Abcissa*; that is $= oicc$: as before, the Square of KI was $= oecc$. But Rectangles having the same Bases, are as their Altitudes; wherefore these Rectangles will be as the *Abcissa*: And these Rectangles are $=$ to the Squares of the Ordinates; wherefore the Squares of the Ordinates are as the *Abcissa*. Q. E. D.

COROLLARY.

If a Line, as LO, be drawn parallel to the Diameter or Axis of the Section, and be cut by the Transverse Line EG in M, and by the Curve of the Parabola in K; then shall OL, ML, and KL, be in continual Proportion.

For the Triangles EFG and ENM being similar, and NM parallel to FG, EF must be to EN:: as FG: NM (*i. e.* IK). But the Squares of GF and IK are in a duplicate Ratio of EF to EN, and yet are by this Proposition as the *Abcissa* FE and EI; wherefore FE to IE, is in a duplicate Ratio of EF to EN; that is, EF: EN:: EN: EI. And by the Construction of the Figure, it will be the same in LO, which is parallel to EF: that is, OL: ML:: ML: KL: or OL, ML, and KL are in continual Proportion. Q. E. D.

PROPOSITION III.

In the Parabola, the Parameter is to the Sum of any two Ordinates, as their Difference is to the Difference of the *Abcissa*.

I say, EL the Parameter, is to $IK + FG$: (see the last Figure) that is, to HO : OG their Difference, is to IF (or KO) the Difference of the *Abcissa*.

Let EF the greater *Abcissa* be called ib , and the lesser EI, eb . Then, by Prop. I. the Square of the Ordinate KI, will be $oecc$, and consequently the Ordinate it self $= \sqrt{oicc}$; so also putting i instead of e , \sqrt{oicc} will be the Ordinate FG.

Having thus noted them, if you set the *Latus Rectum*, the Sum and Difference of the Ordinates, and the Difference of the *Abcissa*, after the manner of four Terms, in disjunct Geometrical Proportion (as below) you will find the Rectangles of the Extremes and Means equal, and consequently the four Terms to be truly proportional. Q. E. D. As,

Param.

ooo : Sum of the Ord. :: Diff. of the Ord.: D. *Abf.*

$b \cdot \sqrt{oicc} + \sqrt{oicc} \cdot \sqrt{oicc} = oicc - \sqrt{oicc} \cdot \sqrt{oicc} = ib - eb$.

And to avoid the Trouble of Multiplication in Surds, which is the Case of the two middle Terms, you need only consider this Theorem: That the Sum of any Two Quantities multiplied by their Difference, is equal to the Difference of their Squares. For so you will easily find, that the Product in both Cases, will be the same Quantity $oicc - oecc$.

N. B. This is that Property of the Parabola on which our famous Mr. Baker founded his *Clavis Geometrica Catholica*, which was unknown to the Ancients, and communicated to him by Mr. Tho. Storde of Maper-ton in Dorsetshire: And by which he shews how to find the Value of the Unknown Root in all Equations, not exceeding Biquadratics.

See Construction and Central Rule.

This Property of the Parabola, I thus briefly demonstrate in my *Algebra*, p. 78.

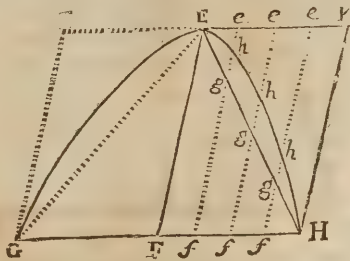
Let P be the Parameter of any Parabola, whose two Ordinates are O and o, and their respective *Abcissa* A and a. Then I am to prove that $P: O + o :: O - o : A - a$. Which is clear; because from the first Property of the Parabola, $PA = OO$ and $Pa = oo$. Wherefore $PA - Pa = OO - oo$, from the Nature of Equations. And that last, resolved into Proportionals, will stand thus,

$$P: O + o :: O - o : A - a.$$

Which was the Thing at first proposed to be proved.

A PARABOLICK Space, is that Area contain'd between the Curve of the Parabola and any Entire Ordinate GH.

And this Space is to a Parallelogram circumscribed as 2, 3, and to a Triangle inscribed as 4, 3.



Let FH, the Semi-Ordinate be divided into 4 Parts, or into 8, 16, &c. and thro' the Divisions draw Lines, as ef , ef , &c. to parallel the Axis EF. Suppose also EF to be 4.

Then I say, The Parabolick Space EHF, is to the Parallelogram F.K :: 2. 3. But to the $\triangle E$ FH :: as 4: 3.

Z z z z For;

For, 1. $gf, gf, gf, &c.$ are in continual Arithmetical Proportion from the Nature of Plain Triangles.

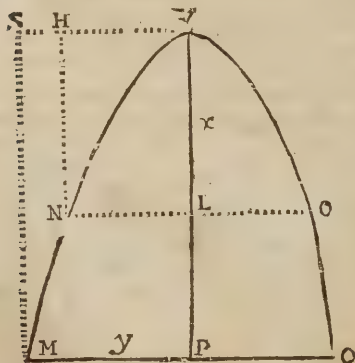
2. $fe, ge :: ge, eb$, (by Cor. 1. Prop. 2. of the Parabola.) But be in the Axis $EF = e$, and in the first Parallel ef must be equal to $\frac{1}{2}$; in the next ef , it will be equal to $\frac{4}{3}$; in the third to $\frac{9}{4}$; and so on in a Duplicate Arithmetical Progression. For as $ef (=4) . ge (=1) :: fo$ is $ge (=1) . eb (= \frac{1}{2})$. And as the second $ef (=4) . eg (=2) :: eg 2, to eb = \frac{4}{3}$, &c. And thus will it be if the Lines $Ff, ff, &c.$ be again bisected, &c. *ad Infinitum*. So that all the Indivisibles of the Trilinear Space $E K H E$ will be in a Duplicate Arithmetical Progression increasing. But

3. The Sum of a Rank of such Terms is sub-triple to a Rank of as many equal to the greatest; (as we proved in N^o 7. of *Arithmetical Progression*, which see) wherefore the whole Trilinear Space $E K H E$ is to the Parallelogram :: as 1 to 3. And consequently the remaining Parabolick Space must be to it as 2 to 3. Q. E. D.

And since the Triangle $F E H$ is to the Parallelogram as 1 to 2, it must be to the Parabola as $\frac{1}{3}$ to 2, or as 3 to 4. Q. E. D.

And this is a true and very short Quadrature of the Parabola of which Archimedes wrote so long ago, and many Geometricians have since expedited. 'Tis plain also that this Demonstration is Universal, and extends to any Parabolick Space.

The Quadrature of the Parabola, by the Method of Fluxions, I have formerly in my *Algebra* shew'd to be very briefly thus:



Let the Parameter be $p = 1$, the Abscissa be called x , and the Ordinate y .

Then by the first Property of the Parabola $x = yy$, because $p = 1$.

And consequently by the Extraction of the Roots of each, and using the new Notation,

$x = y$. Then multiplying x by x the Fluxion of the Abscissa, it will stand thus $xx =$ to the Fluxion of the Area. After which find the

Flowing Quantity answering to that Fluxion, which shall give the Area in known Terms.

To do which, the Fluxion being $xx^{\frac{1}{2}}$, first take away the x , and there will remain $x^{\frac{1}{2}}$; next increase the Index of that Power by Unity, and it will stand thus $xx^{\frac{3}{2}}$. Then divide $xx^{\frac{1}{2}}$ by $1 + \frac{1}{2}$ or by $\frac{3}{2}$ (thus $\frac{1}{2}$) $\frac{xx^{\frac{1}{2}}}{\frac{3}{2}} \left(\frac{2xx^{\frac{1}{2}}}{3} \right)$ and the Quotient you see will be $\frac{2xx^{\frac{1}{2}}}{3}$.

Lastly, instead of $x^{\frac{1}{2}}$ substitute what was before found equal to it, viz. y , and it will be $\frac{2xy}{3} =$ to the Area of the Semi-parabola VMP.

And if you double that, you will gain the Area of the whole Parabola MVO.

Wherefore the Parabolick Area is Two thirds of a Rectangle under the Abscissa and the Ordinate. Q. E. D.

The Following General Method for the Quadrature of all manner of Parabolick Curves, is Mr. Humphrey Ditton's.

The General Equation of these Curves, is $r^{\frac{p-q}{p-1}} x^{\frac{q}{p-1}} = y^{\frac{p}{p-1}}$, where p and q are the Indices, and r is the Latus Rectum: That is, because of r a stable quantity, $x^{\frac{q}{p-1}} = y^{\frac{p}{p-1}}$, wherefore in Fluxions $p y^{\frac{p}{p-1}-1} = q x^{\frac{q}{p-1}-1}$, and from the General Equation, it is $y^{\frac{p}{p-1}-1} : x^{\frac{q}{p-1}-1} :: x : y$, wherefore substituting x and y , instead of $y^{\frac{p}{p-1}-1}$, and $x^{\frac{q}{p-1}-1}$ in the Fluxional Equation, we have $p x y = q y x$, but all $xy =$ all $SHMN =$ the Complement, and all $y x =$ all $PLMN =$ the Area: The Area therefore is to the Complement as $p . q$. Q. E. D.

PARABOLICK Pyramidoid, is a solid Figure, so named by Dr. Wallis from its Genesis, or Formation, which is as follows.

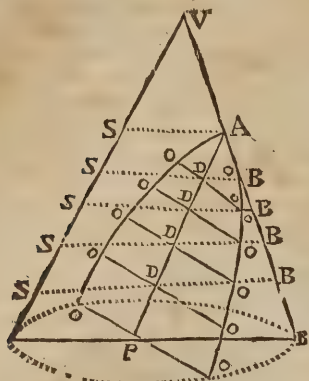
Let all the Squares of the Ordinate Applicates in the Parabola be imagined to be so placed, that the Axe shall pass thro' all their Centres at Right Angles.

Then will the Aggregate of these Planes, which he proves before to be Arithmetically proportional (Prop. 9. Wallis Con. Sect.) Form the Parabolick Pyramidoid.

Whose Solidity is gain'd by multiplying the Base by half the Altitude: The Reason of which is clear; for its component Planes being a Series of Arithmetical Proportionals beginning from 0, their Sum will be = to the Extrems multiplied by half the Number of Terms, i. e. in the present case = to the Base multiply'd by half the height.

PARABOLICK

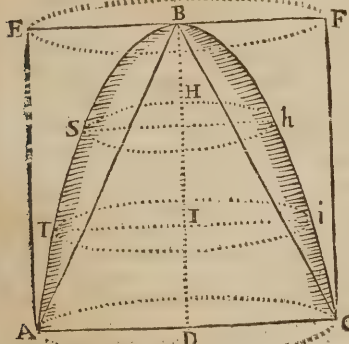
PARABOLICK *Cuneus*, is a Solid mention'd by the same Author, and formed thus :



Multiply all the DB's into the DS's, or which is the same thing, upon the Base APB erect a Prism, whose Altitude shall be AS or PS; and this shall be the *Parabolick Cuneus*, which must of Necessity be equal to the *Parabolick Pyramidoid*; being all the Component Rectangles in one, are severally equal to all the Component Squares in the other.

PARABOLICK *Conoid*, is a solid Figure made by the Rotation of a *Semi-Parabola* about its Axis, and is $\frac{1}{2}$ of its circumscribing Cylinder: And the Circles which may be conceived to be the Elements of this Figure, are in an Arithmetical Proportion decreasing towards the Vertex.

A PARABOLICK *Conoid*, ASB *b* C, is to a Cylinder of the same Base and Height, as 1 to 2; and to a Cone of the same Base and Height, as $\frac{1}{2}$ to 1.



Let BD be divided into Three equal parts; then $\square AD : \square SH :: BD : BH$, (by the second Property of the *Parabola*) that is, as 3 to 1, and $\square AD : \square TI :: BD : BI :: 3 : 2$. Wherefore 'tis plain, That the Squares on SH, TI and AD, (as also on Sb, Ti, and AC) and the Circles answering to them, will be in Arithmetical Progression, or as 1, 2, 3; and thus it will be *ad Infinitum*, if the Three Divisions be bisected, and those again bisected, &c. But a Rank of Numbers in simple Arithmetical Progression, will be to a Rank of as many equal to the greatest as 1 to 2, and consequently, the *Pa-*

rabolick *Conoid*, will be just half the Cylinder. Q. E. D.

And a Cone being $\frac{1}{3}$ of the Cylinder, the *Conoid* will be $\frac{1}{2}$ of it; and therefore Cylinder *Conoid*, and Cone will be as 3, $\frac{1}{2}$, 1.

PARABOLICK *Spindle*, is a solid Body made by Rotation of a *Semi-parabola* about its *Ordinate*; and is equal to $\frac{8}{7}$ of its circumscribing Cylinder, Cavalieri Exerc. Geometr. p. 282.

PARABOLISMUS, the same with the Depression of an Equation. See Equation, N 3.

PARACELSISTICK Medicines. See Hermetical.

PARACENTESIS, or *Punctio*, is a Perforation of the Ghest, or Abdomen. It is made in the Breast, when that is stuffed with putrified Matter, or Water, and then the Perforation is made in the Side between the fifth and sixth Vertebra. It is made in the Abdomen, when that is swelled by a Dropsie, and near the *Linea Alba*, in the Muscles that either ascend right or oblique: In which last Case, if a Man be strong, and has taken a Purge, and also his Lungs, and the rest of his Entrails be uncorrupted, when you see the Navel doth Proruberate, there you must make the Incision; don't let Purulency and Water come out both together, for that were to kill the Patient, but one after the other: As in Seven Days about a Pound, or a Pound and a half, as the Patient can endure it: After the Operation is finished, draw the Wound up with an Astringent Plaister. Blanchard.

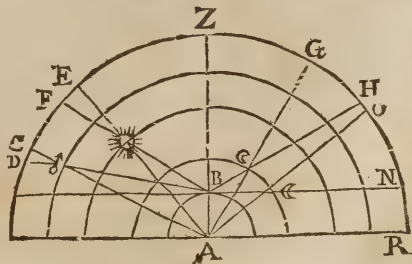
PARACIUM, in Law, signifies the Tenure that is between *Parceners*, viz. That which the Youngest oweth to the Eldest.

PARACHYNANCHE, is an Inflammation with a continual Fever and difficulty of Breathing excised in the outward Muscles of the Larynx.

PARACMASTICA, is a daily declining Fever; also declining Age. Blanchard.

PARADE, is a Military Word, signifying the Place where Troops usually draw together, in order to mount the Guards, or for any other Service.

PARALLAX, is that Arch of a great Circle, passing thro' the Zenith and true Place of the Sun or Stars, and intercepted between the true and apparent Place.



In this Figure,

A, denotes the Centre of the Earth.
B, the Place on the Superficies of the Earth, from whence the Star is seen.
S, S', the Stars or Planets Places in their Orbs.
A S C, A O E, A G, the Lines of their true Places.

B S D,

B ♂ D, B ⊙ F, B ◐, the Lines of their apparent Places.

Here the Angle made by the Interfection of the said two Lines thro' the Body of the Planer, is the Angle of *Parallax*.

That is,

In *Mars*, the Angle A ♂ B = Angle C ♂ D,
(by 15 e. i.)

In the *Sun*, the Angle of *Parallax*, is the Angle
A ⊙ B = Angle E ⊙ F.

In the *Moon*, it is the Angle A ◐ B = Angle
G ◐ H.

Here 'tis manifest, that the nearest Star is to the Horizon, and Center of the Earth, the greater is the *Parallax*: Whence it is, That the Orbit of the Moon being nearest to the Earth, her *Parallax* is greatest and most perceptible: For the Semi-diameter of the Earth bears a greater Proportion to the Semi-diameter of the Moon's Orbit, than to any of the rest.

The Horizontal *Parallax* of the Moon is the Difference between her Real and Apparent Place when she is either Rising or Setting. As suppose her Setting, then the Angle of the Horizontal *Parallax* will be B ◐ A = O A R. The Knowledge of the Quantity of which, is of the greatest use in Astronomy; because from thence the Distance of the Moon, Sun, (or any other Planet) from the Earth may most easily be had; for in the Triangle B A ◐: A B the Semi-diameter of the Earth, B the Right Angle, and ◐ the Angle of the *Parallax* being known, 'tis easie to find any Side or Angle sought, and consequently A ◐, the Distance of the Moon from the Earth. This came first to be discovered by the ancient Astronomers, thus:

They observed, That the apparent Semi-Diurnal Motion of the Moon was but 4 Degrees, whereas in Reality and Truth, it was 6 Degrees: Wherefore they concluded, That the Moon's Place was put forward in her Rising 1 Degree, and as much put backwards in her Setting; which must needs cause her visible Motion above the Earth in 12 Hours, to be observed nearly 2 Degrees less, than the half of 12 Degrees, her apparent Motion, in 24 Hours.

Wherefore from hence they concluded the Horizontal *Parallax* to be just 1 Degree: which having found, 'twas easie to discover, that A ◐ must be near 60 times A B, or 60 Semi-Diameters of the Earth (i. e. at 70 Miles to a Degree, and 4000 Miles the Earth's Radius) 240000 Miles *English*.

Mr. Auzout gives you a Method to find the Moon's Parallax, thus; On a Day when she is in her Perigee, or Apogee, and in the most Boreal Signs,

Take her Diameter towards the Horizon, and then towards the South, with her Altitude above the Horizon; the Difference of which Diameters will shew the Proportion of her Distance with the Semi-diameter of the Earth; but this is best of all done in those Places where she passes thro' the Zenith.

If the Moon's Horizontal *Parallax* could be truly and exactly found, it would be of prodigious Advantage; for by it the Longitudes of Places on Land (and tolerably well at Sea) might be discovered.

Captain *Halley* saith (at the End of his *Observations and Catalogue of the Southern Stars*), "That 'tis the want of a true Knowledge of *Geometry*, " which hath occasioned the Defects and Mistakes " of Astronomers as to this Point."

He there gives three ways to find the Moon's *Parallax*, which are nearly *Geometrical*, of which the first seems the best; and is thus:

Let two times of Observation be taken when the Sun is (nearly) equally distant from each Node of the Moon, and when the Moon also is to be Northerly in one Node, and Southerly in the other; in these Things there needs no great Exactness, because the Differences of Latitude may be sufficiently supplied from the Tables.

At these Times of Observation, let the visible Places of the Moon, both in Longitude and Latitude be taken, together with her visible Altitudes and Diameters, which let be reduced to the Horizontal; then from the Times and visible Places, let in each Observation the Vertical Angle be computed, which is made with the Circle of Latitude at the Moon's Centre; and then the Difference by which the Southern Latitude exceeds the Northern (in our Northern Part of the World) is the Sum of the *Parallaxes* of Latitude, which must be divided into two Parts; which to do, put into one Sum the Logarithms of the Sine of the Horizontal Semi-diameter of the visible Distance of the Moon from the Vertex, and of the Complement of the Angle of the Vertical Circle, with the Cycle of Latitude, in each Observation.

Then out of the greater Sum, take the lesser, and to the Difference add Radius, the Sum shall be the Logarithm of the Tangent of an Ark, from whence take 45 Degrees; then will it be as Radius to the Tangent of the Remaining Ark:: So is the Tangent of the half Sum of the *Parallax*, to the Tangent of half their Difference: But the half Sum and half Difference together, is the greater *Parallax* of Latitude, and the Difference between them is the lesser. Take this *Parallax* of Latitude out of the visible Southern Latitude; or add it to the Northern, and it will shew the *Inclination*.

And then, lastly, it will be as the Rectangle under the Sines of the Distance seen from the Zenith, and of the Complement of the Angle of the Vertical Circle with the Circle of Latitude, is to the Square of the Radius:: So is the Sine of the *Parallax* of Latitude, to the Sine of the Horizontal *Parallax*.

And there is between the Sine of the Horizontal Semi-diameter of the Moon, and the Horizontal *Parallax*, so constant a Proportion, that if it can be but once known, the Moon's *Parallax* at any time will be had from the Observation of her Diameter.

All the Difficulty of this Process, is, in observing the visible Latitudes of the Moon, and which indeed cannot be had without the Help of the Fixed Stars, whose Latitudes are in no Catalogue yet extant, correct to a Minute: Therefore the accurate Solution of this Problem must depend on some better Tables than are yet published. And those I hope we may expect from the most
Accurate

Accurate Astronomer, Mr. *Flamsteed*, when he hath finished his Catalogue of the Fixed Stars, which he is now about.

In the Ingenious Dr. *Gregory's Astronomia Physica & Geometrica*, you have a great and very useful Variety of Propositions for the finding the Parallax, *Vide Lib. 2. Sect. 7.*

Though there be no Parallax of the Fixed Stars, in respect of the Earth's Semi-diameter, the whole Body of the Earth being but a Point in reference to the Distance between us and the Fixed Stars; yet in respect of the annual Orbit of the Earth, it hath justly been expected by Astronomers, that some Parallax should be found: And this would be a Discovery of great Moment, if it could be made; because it would be an undoubted Demonstration for the annual Motion of the Earth round the Sun, if any such Parallax could be discovered.

This the Ingenious Dr. *Hook* attempted to find by observing the various Distance of a Fixed Star from the Zenith (See a Dissertation of his designedly written on this Subject). And our Excellent Astronomer Mr. *Flamsteed*, actually did observe it by the Access and Recess of a Fixed Star to and from the Pole of the Equator at different Times of the Year.

And he assures us, in his Letter to Dr. *Wallis*, written Decemb. 20. 1698, and published in the Latin Edition of Dr. *Wallis's Works*: "That he found the Distance of a Fixed Star near the Pole of the World to be 40 Seconds, or 45 Seconds nearer to it at the Winter-Solstice than at the Summer one." And this he observed for Seven Years together with great Accuracy.

So that he judges the Objection of *Ricciolus* against the Earth's Motion to be intirely removed, and its Revolution round the Sun proved.

Dr. *Gregory* seems not satisfied with this Proof, (though he believes the Doctrine from other Principles) but inclines rather to the Opinion of *Copernicus*, That the Diameter of the Earth's annual Orbit is insensible, in respect of the Distance of the Fixed Stars. But others may judge whether he brings Reasons sufficient to overthrow Observations so carefully, and so often made, as those produced by Mr. *Flamsteed*. See his *Astron.* P. 275, 276.

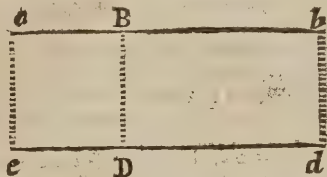
PARALLAX of Latitude, is an Arch of a great Circle passing by the Poles of the Zodiac to the apparent Place of the Star, and intercepted between two Circles of the Ecliptick equally distant, whereof the one passeth by the True place of the Star, and the other by the Apparent place.

PARALLAX of Longitude, is an Arch of the Ecliptick (or Parallel thereto) intercepted between two great Circles, whereof the one passeth from the Poles of the Ecliptick, and the true Place; the other from the said Poles by the apparent Place: So that the Parallax of Longitude is only the Difference of the true and apparent Place according to the Longitude of the Ecliptick.

PARALLACTICAL Angle, is an Angle made by the Oblique cutting of a Circle of Altitude, or Vertical Circle with the Ecliptick: How to find it, see *Angle of the Ecliptick with the Vertical Circle*.

PARALLEL Lines, in Geometry, are those which run always equi-distant from each other; so that if they were infinitely produced, they would

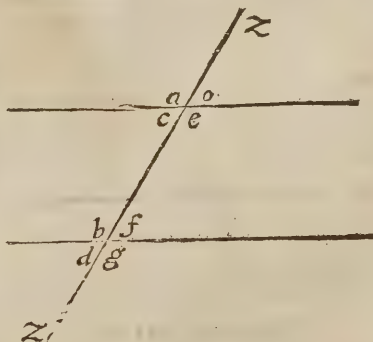
neither go further from, nor come nearer to each other; and their Distance is always measured by a Perpendicular, which, where-ever it be taken, is of the same Length, or is always equal to it self.



Thus the two Lines, *a b* and *c d*, are Parallel, if they are equally distant from each other in *a c*, *B D*, *b d*, and in all other Places.

COROLLARY I.

Parallel Lines *P p*, have the same Inclination one as the other, to any Right Line as *Z Z*, which cuts or crosseth them both, and consequently (since an Angle is the Mutual Inclination of two Lines which meet in a Point) the External Angle *o* or *a*, must be equal to the Internal and Opposite One, *f* or *b*: that is, $o = f$, and $a = b$.



For if *o* be not equal to *f*, and *a* not equal to *b*, it must be because the upper Parallel *P*, is either more or less inclined to *Z Z*, than the lower Parallel *p* is; which if true, then the Line cannot be parallel; which contradicts the Supposition.

PROPOSITION.

A Right Line *Z Z* falling on Two Parallel Lines *P p*, makes the alternate Angles $o = f$, and $e = b$; also $o = d$, and $a = g$, and the two Internal Angles $c + b$, or $e + f$ = to two Right ones.

That is, $\begin{cases} 1\ o = f \\ 2\ e = b \\ 3\ o = d \\ 4\ a = g \end{cases}$ and $\begin{cases} 5\ c + b \\ 6\ e + f \end{cases} = 2\text{ Right Angles}$

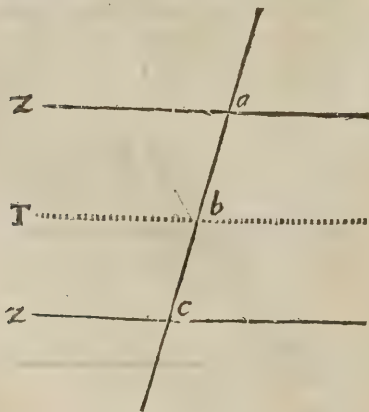
DEMON-

DEMONSTRATION.

1. $c = f$, because $c = o$, its Vertical or opposite Angle, and $o = f$, by the precedent Corollary.
2. $e = b$, because $= a$, which is $= b$, proved the same way.
3. $o = d$, because $= c$, $= f$, $= d$.
4. $a = g$, because $= e$, $= b$, $= g$.
5. $c + b = 2 L$, because $b + f = 2 L$, (by 13 e 1 Euclid.) and $f = c$ by Step. 1. Wherefore $c + b = 2 L$.
6. $e + f = 2 L$, because $f + b = 2 L$, (by 13 e 1 .) and $e = b$ (by Step. 2.) Wherefore $e + f = 2 L$. See the last Figure.

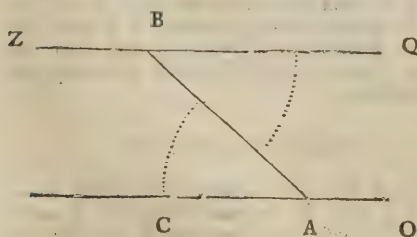
COROLLARY II.

Two Right Lines as ZZ , parallel to a Third, as T , are parallel to each other. For since the Angle $a = b$, and c also $= b$, because the Outer Lines are parallel to the Inner one: Therefore the Angle $a = c$, i. e. the two Outer Lines, are also parallel by Cor. 1.



PROBLEM I.

A Right Line, as ZQ , being given, to draw another parallel to it, thro' A , a given Point.



From A draw a Line making any Angle, as ABQ , with the given Line; then setting one Foot of the Compasses in A , make the Angle $BAC = ABQ$, so shall CAO be the Line required, for the Angle $A =$ to the Alternate one B .

PARALLEL Sphere, is where the Poles are in the Zenith and Nadir, and the Equator in the

Horizon, which is the Case of such (if any such there be) who live directly under the North and South Pole.

The Consequences of this Position are, That the Parallels of the Sun's Declination will also be Parallels of his Altitude.

The Inhabitants can see only such Stars as are on their side the Equinoctial; and they must have six Months Day, and six Months continual Night every Year; and the Sun can never be higher with them, than 23 Degrees 30 Minutes, which is not so high as he is with us in February.

PARALLEL Ruler, is an Instrument made of Brass, Steel, or Wood, to draw Lines parallel to each other; of great Use in Fortification, Architecture, and many other Parts of the Mathematics.

PARALLELS of Altitude, or Almucanters, are Circles parallel to the Horizon, imagined to pass thro' every Degree and Minute of the Meridian, between the Horizon and Zenith, having their Poles in the Zenith. And on the Globes there are described by the Divisions on the Quadrant of Altitude, in its Motion about the Body of the Globe, when 'tis screw'd to the Zenith of any Place.

PARALLELS of Latitude, on the Terrestrial Globes, are the same with Parallels of Declination on the Celestial. But the

PARALLELS of Latitude on the Celestial Globes, are small Circles parallel to the Ecliptick, imagined to pass through every Degree and Minute of the Colures, and are represented there by the Divisions of the Quadrant of Altitude, in its Motion round the Globe, when it is screw'd over the Poles of the Ecliptick.

PARALLELS of Declination, are Circles parallel to the Equinoctial, imagined to pass thro' every Degree and Minute of the Meridians, between the Equinoctial and each Pole of the World.

PARALLEL Rays, in Opticks, are those that keep an equal Distance from the visible Object to the Eye, which is supposed to be infinitely remote from the Object.

PARALLEL Planes, are those Planes which have all the Perpendiculars drawn betwixt them equal to each other; that is, when they are every where equally distant.

PARALLEL Circles on the Globes, the same with the Lesser Circles.

PARALLELS also on the Terrestrial Globe, are Circles drawn thro' the middle of every Climate, dividing them into two Halves, which are called Parallels.

PARALLELISM of the Earth's Axis, is the Earth's keeping its Axis in its annual Revolution round the Sun, in a Position always parallel to its self, which it doth nearly, but not exactly; for tho' the Difference be insensible in one Year, Dr. Gregory in his Astronomy saith, It becomes sensible enough in many Years.

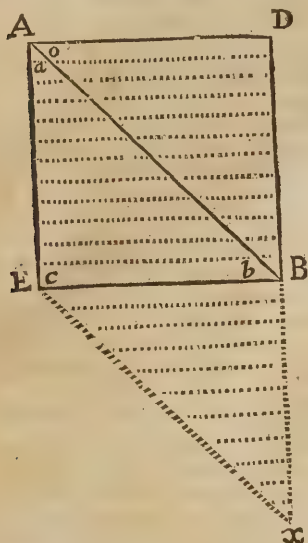
This Parallelism he shews to be the necessary Result of the two Motions of the Earth, that is round its Axis, and its Annual one; and that there needs no third Motion be feigned to explain it, or account for it: For as the Earth moves Annually round the Sun (without the Diurnal Motion) it moves only according to its Centre of Gravity; and each Point and Line in it keeps always the same Position: Let its Axis be one of those Lines; the Diurnal Revolution of the Earth round this (which as to that Motion is supposed immoveable)

able) cannot change the Position of it; and therefore it will be always the same, *i. e.* always Parallel to it self.

PARALIPSIS (a Figure in *Rhetorick*) is a pretended desire in us of omitting what we say; as if one should say, *I am willing to forget the Wrong that my Enemy has done me; I will not speak of the Injury that I have received from him, &c.*

PARALLELOGRAM in *Geometry*, is a Right Lined Quadrilateral Figure, whose Opposite Sides are Parallel and Equal. To find its Superficial Content: See *Area*.

The Formation, or Generation of all Parallelograms, Squares, and Rectangles, may be thus conceived.



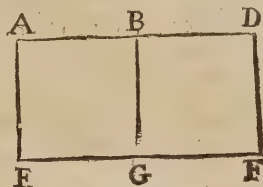
If a Right Line, as AD, having one of its Ends or points in the Top (or Vertex A) of the Angle EAB, be supposed to move downwards, with a Motion always Parallel to its self in its first situation: And as it moves thus, always keep its said end A in the Line AE; till at last it be moved down so low, as that it is all of it gotten within the Legs of the Angle, and is come to lie in the Situation EB: 'Tis plain, this Line AD, will by its Motion downwards have described the Quadrilateral Figure ADBE. And as in its Descent, the Line AD continually cuts the Line AB, so it will describe also on each side of AB the two equal Triangles ADB and AEB. The Parts of the former of which, do continually decrease, as those of the latter AEB do increase.

Also, if either Leg of an Angle EAD, as suppose the Leg AD, or any part of that Leg AB, be conceived to move along the other AE, with a Motion Parallel to its first Situation, it will also describe a Quadrilateral Figure, which if the Describent Line AB, be equal to the Dirigent AE, (for so those two Lines may be called) will be an Equilateral one. But when the Dirigent is either longer or shorter than the Describent Line, then the opposite Sides of the Figure only will be equal.

From which Formation of Quadrangles, (and also of Triangles) these Corollaries may be deduced.

COROLLARY I

That all Quadrilateral Figures thus formed, must also be Parallelograms, or have their opposite Sides equal and parallel. The Reason of which is because the Moving Line, or Describent AD, is always supposed to be carried Parallel to it self; and the Distance between A and D, or A and B the Describent Points, are always the same. 33. *e. 1.*



COROLLARY II

Since the Angles A and E are together equal to two Right Angles, if one be a Right Angle, the other must be so also; and then all the Angles of the Figure will be Right ones, and so 'twill be a Rectangle as AF; and if the Describent be equal to the Dirigent, the Figure will be a Square, as AG. *Cor. 29. e. 1. Eucl.*

Hence also 'tis plain, That the Opposite Angles of every Parallelogram are equal; because they do each of them, with the Angle between them, make two Right Angles.

COROLLARY III

Whence it appears, That every Diagonal AB, Divides, the Parallelogram into two equal Parts: 34. *e. 1. Eucl.*

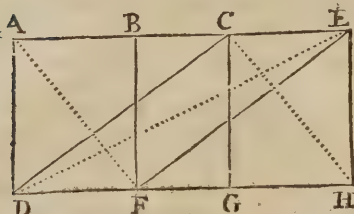
COROLLARY IV

As also, That every Parallelogram must be Double to a Triangle, having the same, or an equal Base and Height. 41. *e. 1. Eucl.*

For every Triangle that can be drawn on the Base EB, or on a Base equal to it, and having the same Height, or being between the same Parallel Lines, will be equal to the Triangle AEB, which is half the Parallelogram AB, *per Cor. 3.*

COROLLARY V

Hence all Parallelograms that are between the same Parallel Lines, and on one and the same, or equal Bases, must be equal.



I say, The *Parallelograms* AF, DE, GE, having the same Base DE, or its equal GH, must be equal to one another.

For the *Parallelograms* AF, and GE, have both the Describent and Dirigent Lines equal.

And also, AF, and DE, have the same Describent Lines DF; and the Line DE, tho' it go not in the same Dirigent Line to form the *Parallelogram* DE, yet it goes in the whole but the same Perpendicular Altitude, and only moves slower for going Obliquely, but all the Indivisibles or Component Lines in one, must be equal to those in the other.

COROLLARY VI.

Hence also follows, That Triangles on the same, or equal Bases must be equal if they are between the same Parallels; because they are the Halves of equal *Parallelograms*.

COROLLARY VII.

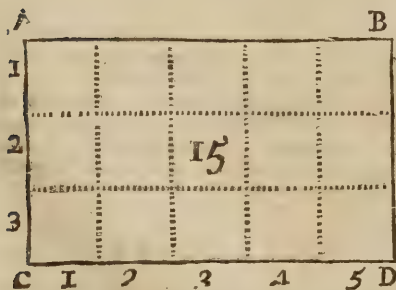
Also from hence is easily proved, That the three Angles a, b, c , of any Triangle, are equal to two Right Angles. (See Fig. 1.)

For since the Angle $c + a + o = 2L$, (because A D is Parallel to E B.)

And that $b = o$, for the same Reason.

Therefore $b + c + a = 2L$. Q E D.

COROLLARY VIII.



If the Line A C, standing at Right Angles with C D, be divided into Three Parts, as C D is into Five; and being made a Describent, be moved along the Dirigent C D, till it come at last to the End of it, and stand in the Position B D; the *Rectangle* A D will by this means be divided into as many little *Rectangles* as the Unites both in the Describent and Dirigent Line will produce, by being multiplied one by another, that is 15; for

3 times 5 is 15. And this is what is called a *Rectangle* made between any two Lines, or the Product arising from the Parts of the one multiplied by the Parts of the other.

And this is usually in the *Latin* Tongue express'd by the Verb *ducere*, which signifies to lead or guide along. As, for Instance, if the Line A C were to multiply C D, they would say in that Language, *Duc A C in C D*; that is, set your Line A C perpendicular to C D; and then keeping it always in that Position, lead or guide it along till it comes to the End of C D, and it will by its Motion have formed the *Rectangle* A D; and by its Three Parts, the 15 little ones within it. And therefore in *Latin* Mathematical Books the Product would be thus expressed, *AC Ducta in CD = 15*.

And from hence 'tis plain, that the Product of any two Numbers is equal to a *Rectangular Parallelogram*, made out of the Multiplicand and the Multiplier, or out of the two Factors, as they are called by some Writers; that is, a *Rectangle* whose two Sides are divided into as many Parts as there are Unites in both Factors.

PARALLELOGRAM, is also an Instrument made of five Rulers of Brass or Wood, with Sockets to slide or set to any Proportion, used to enlarge or diminish any Map or Draught, either in Fortification, Building or Surveying, &c.

PARALLELOGRAM Protractor, is a Semi-circle of Brass, with four Rulers, in form of a *Parallelogram*, made to move to any Angle: one of which Rulers is an Index, which shews on the Semi-circle the Quantity of any inward or outward Angle.

PARALLELOIPEID, is a Solid Figure contained under Six *Parallelograms*, the Opposites of which are equal and parallel; or 'tis a Prism, whose Base is a *Parallelogram*. This is always triple to a Pyramid of the same Base and Height, as is demonstrated under *Proportion of Solids*; which see.

PARALLELOPLEURON, a Word used by some Geometricians for an Imperfect *Parallelogram*, or kind of Trapezium, having unequal Angles and Sides, yet not all so, in regard that at least some of them answer to one another, observing a certain Regularity and Proportion of Parallels; so that they do not extend so largely as Trapeziums, which are any Irregular Four-sided Figures; nevertheless, like them, they are capable of being variously diversify'd.

PARALOGISM, is a pretended Demonstration or Method of Arguing, but which is in reality fallacious and false.

PARALYSIS, the Palsy, is an entire Loss of voluntary Motion or Sense, or both, either in all the Body, or only in some Part. It comes by either an Obstruction, Obfession, Contusion, or pressing of the Nerves, or by an Indispotion, or ill Conformity of the Muscles. *Blancbard*.

PARAMESUS, is the next finger to the Middle one, called the Ring-finger.

PARAMETER, by some, as *Mydorgius* and others, called the *Latus Rectum* of a *Parabola*, is a Third Proportional to the *Abscissa* and any *Ordinate*: So that the Square of the *Ordinate* is always equal to the *Rectangle* under the *Parameter* and *Abscissa*. See the Demonstration under *Parabola*.

This

This Word *Parameter*, or *Latus Rectum*, is also used as to the *Ellipse* and *Hyperbola*; but in thole it hath another Proportion, as you will find under thole Words.

PARAMOUNT, in our Law, signifies the Supreme Lord of the Fee: For there may be a Tenant to a Lord, that holdeth himself another Lord; the former of which is called *Lord Mesne*, and the second *Lord Paramount*. And a *Lord Paramount* consisteth only in Comparison, as one Man may be great, being compared to a less; and little, being compared with a greater. So that none simply seemeth to be *Lord Paramount* but only the King, who is *Patron Paramount* to all the Benefices in England.

PARAPET, in Fortification, is an Elevation of Earth and Stone upon the Rampart, behind which the Soldiers stand secure from the Enemies Great and Small Shor, and where the Cannon is planted for the Defence of the Town or Fortresses. Every *Parapet* having its *Embrasures* and *Merlons*, is about Six Foot high on the Side of the Place; and from Four to Five on that towards the Country. So that this Difference of Heights forms a kind of *Glacis* above, from whence the Musketeers mounting the *Banquet* of the *Parapet*, may easily fire into the Moats, or at least upon the Counterfearp. It ought also to be from 18 to 20 Foot thick, if made of Earth; and from 6 to 8 if of Stone. The Earth is much better than Stone, because Stone will fly to pieces when battered, and do mischief.

This Word *Parapet* is also given to any Line that covers Men from the Enemies Fire: So there are *Parapets* of Barrels, of Gabions, of Bags filled with Earth, &c.

PARAPHANALIA, or, according to the Civil Law, *Paraphernalia*, are those Goods which a Wife, besides her *Dower* or *Jointure*, is after her Husband's Death allowed to have; as Furniture for her Chamber, Wearing Apparel, (and Jewels, if the be of Quality) which are not to be put into her Husband's Inventory, especially in the Province of *York*.

PARAPHIMOSIS, is a Fault of the Yard, when the *Preputium*'s too short; also a Narrowness and Contraction of the Womb.

PARAPLEGIA, is a Palsie which seizeth all the Parts of the Body below the Head, thro' an Obstruction of the Spinal Marrow. *Blanchard*.

PARAPHRENITIS, is madness accompanied with a continual Fever, through the Inflammation of the *Diaphragm*, with Difficulty of Breathing, as the Ancients dream'd. But *Doctor Willis* has confuted this Opinion of it, and says the Matter of it lies in the *Cerebellum*, whereby the Animal Spirits cannot flow, and thence the Midriff and Lungs are troubled. *Blanchard*.

PARAPHROSYNE, is a slight sort of Dreaming in the Imagination and Judgment. *Blanchard*.

PARASELENE, a *Mock Moon*, is occasion'd by the same Means as the *Parhelia* are about the *Sun*; tho' not so frequent.

PARASITICAL Plants, are those which some call *Epidendras*, because they grow not on the Ground, but on the Arms or Limbs of Trees, as our *Viscum* or *Mistletoe* doth.

PARASTATÆ. See *Epididymis*.

PARASYNANCHE, is an Inflammation of the Muscles of the Upper part of the *Oesophagus*, with a continued Fever.

PARAVALLE, in Common Law, signifies the lowest Tenant, or him that is Tenant to one who holdeth his Fee over of another; and is called *Tenant Paravaile*, because it is presumed he hath Profit and *Avails* by the Land.

PARBUNCLE, is the Name of a Rope in a Ship, almost like a pair of Slings: 'tis seized both Ends together, and then put double about any heavy thing that is to be hoisted in or out of the Ship; having the Hook of the Runner hitched into it to hoist it up by.

PARCENERS, is a Word taken either according to the Course of the Common Law, or according to Custom. *Parceners*, according to the Course of the Common Law, are, Where one seized of an Estate of Inheritance, hath Issue only Daughters, and dies, and the Lands descend to the Daughters, then they are called *Parceners*, and are but as one Heir. The same Law is, If he have not any Issue, but that his Sisters be his Heirs.

Parceners, according to Custom, are, Where a Man is seized of Lands in *Gavel-kind*, as in *Kent*, and other Places Franchised, and hath Issue divers Sons, and dies, then the Sons are *Parceners* by the Custom.

PARCENARY, in Law, signifies a holding or occupying of Land *pro indiviso*, by Joint-Tenants, or otherwise called *Co-parceners*: For if they refuse to divide their common Inheritance, and choose rather to hold it jointly, they are said to hold in *Parcenary*.

PARCO Fracto, is a Writ that lies against him that violently breaketh a Pound, and taketh our Beasts thence, which for some Trespasses done upon another Man's Ground, are lawfully impounded.

PARCELLING of a Ship, is laying of Pieces of Canvase of about a Hand's breadth, over the Seams, when she is newly Calked.

PARCEL-Makers, are two Officers in the *Exchequer* that make the *Parcels* of the *Escheators* Accounts, wherein they charge them with every thing they have levied for the King's Use within the Time of their Office, and deliver the same to one of the *Auditors* of the Court to make an Account with the *Escheator* thereof.

PARENCEPHALOS, the same as the *Cerebellum*.

PARENCHYMOUS Parts of the Body, by the Old Anatomists, are reckoned such Flethy Parts of it as fill up the Interstices between the Vessels, and not consisting of Vessels themselves. But by the Help of the Microscope, and more accurate Observations, it hath since been discovered, that there is no part of an Animal Body but what is a kind of Net-work of an innumerable Quantity of small Capillary Vessels.

PARENCHYMATA, are the Intrails thro' which the Blood passes for its better Fermentation and Perfection, as the Lungs, Liver, Heart, and Spleen, &c.

Sometimes the Word *Parenchyma* is taken in a large Sense for all the Intrails. *Blanchard*.

PARIETAL Bones, or the Bones of the *Synsippus*, are the thinnest Bones of the Cranium, in Form almost square, somewhat long; they are joined to the *Os Frontis* by the *Sutura Coronalis*, to one another in the Crown of the Head by the *Sutura Sagittalis*, to the *Os Occipitis* by the *Lambdoidalis*, and to the *Ossa Temporum* by the *Sutura Squamosa*. They are smooth and equal on

on their Out-side, but on their Inside they have several Furrows made for the Passage of the Veins of the *Dura mater*. They have each a small Hole near the *Sutura Sagittalis*, through which there pass some Veins which carry the Blood from the Teguments to the *Sinus Longitudinalis*.

PARISTMIA, or *Amygdala*, are two Glandules of the Mouth tied together by a broad slender Production; they have one common Cavity large and oval, opening into the Mouth. The Use they serve for is, to transmit a certain slimy or pituitous Matter into the Jaws and Mouth. They are called also *Tonsille*, which see. *Blanchard*.

PARK of the *Artillery*, is a certain Place in a Camp without Cannon-shot of the Place besieged, where the Cannon, Artificial Fires, Powder, and other Warlike Ammunition are kept, and guarded only by Pike-men, to avoid Casualties which may happen by Fire. Every Attack at a Siege hath its *Park of Artillery*.

PARK of *Provisions*, is another Place in the Camp on the Rear of every Regiment, which is taken up by the Sutlers, who follow the Army with all sorts of Provisions, and sell them to the Soldiers.

PARONYCHIA, a *Whitlow*, is a preternatural Swelling in the Fingers, and very troublesome: It arises from a sharp malign Humour, which sometimes gnaws the Tendons, Nerves, the Membrane about the Bone, and the very Bone it self. *Blanchard*.

PAROTIDES, are glandules behind the Ears; also a preternatural Swelling of those Glandules.

PAROXYSM, a *Fit*, is Part of the Period of Diseases, whereby they encrease and grow worse. It is either Regular, which returns at certain Times, as in a Tertian or Quartan Ague; or Irregular, that hath no certain Times, but comes sometimes one Day, sometimes another, as the Erratick Ague. *Blanchard*.

PARRELS, in a Ship, are Frames made of Trucks, and Ribs, and Ropes, which having both their Ends fastened to the Yards, are so contrived as to go round about the Masts, that the Yards by their means may go up and down upon the Masts. These also, with the Breast Ropes, do fasten the Yards to the Masts.

PARRICIDE, signifies properly him that kills his Father, and may be applied to him that murders his Mother.

PARSON, *Persona*, is the Law Term for the Rector of a Church; because for his Time he represents his Church, and sustaineth the Person thereof, as well in suing, as in being sued in any Action Touching the same. Formerly he who had a Church by Institution and Induction only for his own Life, was called *Parson Mortal*.

But any Collegiate or Conventual Body, to whom the Church was for ever appropriated, was called *Parson Immortal*.

In the New book of Entries, *Verb. Aid in Annuity*, are these Words: *Et Prædictus A. dicit quod ipse est Persona Prædictæ Ecclesiæ de S. Impersonata in eadem ad Præsentationem F. Patronis*. By which it seems that *Persona* or *Parson* anciently was the Patron, and *Persona Impersonata* the Rector to whom the Benefice was given by the Patron's Right; which also *Dyer* sheweth, fol. 221. So that in Law, the *Parson Impersonæ* is he that hath the Possession of a Benefice or Rectory, be it appropriate, or otherwise, by the Act of another.

PARSONAGE, or *Rectory*, is a Spiritual Living composed of Glebe-Land, Tythe, and other Oblations of the People, separate or dedicate to God in any Congregation, for the Service of his Church there, and for the Maintenance of the Minister to whose Charge the same is committed.

PARTES *Finis nihil habuerunt*, &c. in the Common Law, is an Exception taken against a Fine levied.

PARTIES, in Law, are those which are named in a Deed, or Fine, as Parties to it; as those that Levy the Fine, and to whom the Fine is levied: So those that make any Deed, and they to whom it is made, are called *Parties in the Deed*.

PARTITIONE *Facienda*, is a Writ that lies for those that hold Lands or Tenements *pro indiviso*, and would sever to every one his Part, against him or them that refuse to join in *Partition* as Copartners, &c.

PARTITION, is a dividing of Land descended by the Common Law, or by Custom, among Co-Heirs or Parceners, where there are two at least; and this Partition is made Four ways, whereof Three are by Agreement, the Fourth by Compulsion. The First *Partition* by Agreement is, When they divide the Land equally themselves into so many Parts as they are Coparceners, and each to choose one Share or Part, according to Order. The Second is, when they choose some of their Friends to make the Division for them. The Third is by drawing Lots, thus: Having first divided the Land into as many Parts as there are Parceners, they write every part severally in a distinct Scroll, and wrapping it up, throw each of them into a Hat, Basin, or such like thing, out of which each Parcener draws one, according to their Superiority; and so the Land is severally allotted. The Fourth *Partition*, which is by Compulsion, is, When one or more of the Parceners, by reason of the Refusal of some other, sues out a Writ of *Partitione facienda*; by Force whereof they shall be compelled to part.

In *Kent*, where Land is of *Gavel-kind* Nature, they call their Partition, *Shifting*.

Partition also may be made by Joint-Tenants, or Tenants in Common, by Ascent, by Deed, or by Writ.

PARTY-Fury. See *Medietas Lingue*.

PARTNERS, in a Ship, are strong pieces of Timber bolted to the Beams incircling the Masts, to keep them steady in their Steps, and also keep them from rowling (that is falling) over the Ship's Sides. There are also of these *Partners* at the Second Deck, to the same End; only the Mizen-mast hath only one pair of *Partners* in which that Mast is wedged so firm, as that it can by no means budge. Some Ships sail not well, unless their Masts are loose, and have leave to play in the Partners: But in a Storm this is dangerous, lest the Partners should be *wronged*, (as they say) i. e. forced out of their places; for then there is no Help, but to cut the Mast by the Board.

PARTNERSHIP, a Rule in Arithmetick; the same with the *Rule of Fellowship*, which see.

PART *Proportional*, is a Part or Number agreeable and analagous to some other Part or Number; or a Medium to find out some Number or Part unknown by Proportion and Equality of Reason.

PAR Vagus, a pair of Nerves arising below the *Auditory* ones, from the Sides of the *Medulla Oblongata*, behind the *Processus Annularis*, by several Threads which join together, and go out by the same Hole that the *Sinus Laterales* discharge themselves into the *Jugulares*. It is joined by a Branch of the *Nervus Spinalis*, or *Accessorius Willisii*, and by a small Branch of the *Portio Dura*. Immediately after it comes out of the Skull, it gives a small Branch to the *Larynx*, as it goes down the Neck, above the *Intercostal Nerve*, by the Side of the *Internal Carotide*. At the *Axillary Artery* it casts back the *Recurrent Nerves*, of which the Right embraces the *Axillary Artery*, and the Left the *Aorta*. These two Branches ascend on each side of the *Trachea*, or *Aspera Arteria*, to the *Larynx*, where they are spent on the Muscles of the *Larynx* and Membranes of the *Trachea*. This Pair, after it has entered the Cavity of the *Thorax*, sends out several Branches to the *Pericardium*, Heart, Lungs, and Concave side of the Liver.

This Pair of Nerves was formerly accounted the Sixth, but is now usually reckoned the Eighth.

There is a notable Fibre, or rather Nerve, coming from the Spinal Marrow, about the Sixth or Seventh *Vertebra* of the Neck, which is so joined to this *Par Vagus*, as if they grew into one Nerve; being covered with it, with the same Coat, from the *Dura mater*, but appears distinct when that is taken off. This Nerve they call the *Accessory Nerve*, which runs to the Muscles of the Neck and Shoulder-Blade.

Out of the Trunks of this Eighth Pair spring two Nerves that they call the *Recurring Nerves*; the Right of which rises higher, and winds about the *Axillary Artery*; the Left springs lower, and twisting about the Trunk of the descending *Aorta*, recurs or returns back from thence.

Dr. Willis thinks this *Recurrent Nerve* to be really a distinct one from the very Original, to be no Branch of the *Par Vagus*, but only is included in the same Coat or Cover with it, for Safety and Convenience of Passage.

About the first or second Rib this Pair hath a kind of *Plexus* or Knot, which is called *Plexus Cardiacus*, because it sends out Twigs which go to the Heart and its Appendages.

PARVO Nocumento, is a Writ of Nuisance; which see.

PARVUM & Crassum, is the Fourth Pair of Muscles of the Head; so called, because it is but a little one, yet pretty thick. It lieth under the *Complexum Trigeminum*, or Third Pair, and rises Nervous from the Transverse Processes of the Six uppermost *Vertebrae* of the Neck, and is inserted into the hinder Root of the Mamillary Process.

PARYLIS, is an Inflammation, Rottiness, or Excrefcency among the Gums. *Blanchard*.

PASCHA Clausum, signifies the *Ostaves* of Easter, or Low-Sunday, which closes or concludes that Solemnity. *Dia (cali) post pascha clausum*, is a Date in some of our Old Deeds. And the first Statute of *Westminster*, Anno 3 Edw. 1. is said to have been made *lendes mena de la close de Pasche*, that is, the Monday after Easter-Week.

PASCHAL Rents, are Rents or Annual Duties paid by the Inferior Clergy to the Bishop, or Archdeacon, at their *Easter Visitations*. They are also called *Synodals*; which see.

PAS de Souvris, a French Term in Fortification; the same with *Berne*; which see.

PASSANT. The Term in Heraldry for a Lion born in any Escutcheon in a walking Posture. But this in most other Beasts, they call *Tripping*.

PASSAGIO, is a Writ directed to the Keepers of the Ports, to permit a Man to pass over Sea that hath the Kings License.

PASSARADO, is a Rope in a Ship, whereby all the Sheer-Blocks of the Main and Foresails are haled down after; the *Clew* of the Main-sail to the *Cubbridge-head* of the Main-mast, and the *Clew* of the Fore-sail to the *Cat-head*. This is to be done when the Ship goes large; and they are also kept firm down, and hindred from flying up, by this *Passarado-Rope*.

PASSPORT, signifies a Licence made by any one that hath Authority, for the safe Passage of any Man from one Place to another.

PASSIVE Principles. So the Chymists call *Water* and *Earth*, because either their Parts are at rest, or else at least not so rapidly moved as those of Spirit, Oil, and Salt, and so do serve to stop and hinder the quick Motion of the *Active Principles*. Besides if these Principles could be drawn pure, they would have nothing in them but bare Bulk, Figure, Colour, and Weight; the one is a Fluid, the other in a Solid Form; and would be without either Smell, Taste, &c. or any Active Operations.

PASTILIS, are Odoriferous Tablets, or Trochisks made up of Perfumes or Odorous Bodies, with Mucilage or Gum *Tragacanth*.

PATE, in Fortification, is a kind of Platform like what they call an Horseshoe, not always regular, but generally oval, encompassed only with a Paraper, and having nothing to flank it. It is usually erected in Marshy Grounds to cover a Gate of a Town.



PATEE, a Term in Heraldry for a Cross of this Figure. The Field is *Sable* a Cross *Patee Argent*, by the Name of *Cross*: This Form of a Cross is called also *Formee*.

PATELLA. See *Mola genu*, the Knee Pan.

PATENTS. See *Letters Patent*.

Note, That *Patents* differ from *Writs*, and that a Coroner is made by Writ, and not by *Patent*.

PATENTEE, is he to whom the King grants his *Letters Patent*.

PATHETICK Nerves, are the Fourth pair arising from the Top of the *Medulla Oblongata*, (and so is different from all others, which arise either from its Base or Sides) behind the round Protuberances, called by Anatomists the *Nates* and *Testes* of the Brain; whence bending forwards by the Sides of the *Medulla Oblongata*, they presently hide themselves under the *Dura Mater*; under which proceeding a while, they pass out of the Skull, each in a single Trunk, at the same Hole with the Optick Nerves, (and they communicate with no other in their whole Passage) and are bestowed entirely, as *Willis* saith, on that Muscle of the Eye which they call *Trochlearis*, because it serves to rowl the Eyeball about; which being a Motion that is usually consequential upon some Passion of the Mind, such as Love, &c. these Nerves

Nerves are therefore very properly called *Oculorum motores pathetici*.

PATH of the *Vertex*, a Term frequently used by Mr. Flamsteed in his *Doctrine of the Sphere*, and signifies a Circle described by any Point of the Earth's Surface, as the Earth turns round its Axis. This Point is considered as Vertical to the Earth's Centre, and is the same with what is called the *Vertex* or the *Zenith* in the *Ptolemaick Projection*.

The Semi diameter of this *Path of the Vertex* is always equal to the Complement of the Latitude of the Point or Place that describes it; that is, to that Places Distance from the Pole of the World.

PATHOGNOMONICK, a Term in the Art of Medicine, is a proper inseparable Sign which agrees only to such a thing, and to all of that kind, and tells the Essence of its Subject, and also lasts from the Beginning to the End; as in a true Plurisie there's always a continual Fever, hard Breathing, and Stiches, with a Cough. *Blanchard*.

PATHOLOGY, is a part of Physick that teacheth us the preternatural Constitution of a Man's Body, so as thereby to discover the Nature and Causes of Diseases.



PATONCE: The Herald's Term for one of their Crosses of this Figure.

Gules, a Cross Patonce, Argent, by the Name of Latimer.

PATRIMONY, is an Hereditary Estate, or Right, descended from Ancestors. The Legal Endowment of a Church, or Religious House, was called *Ecclesiastical Patrimony*.

PATRON, is used in the Civil Law for him that hath manumitted a Servant, and thereby is both justly accounted his great Benefactor, and challengeth certain Reverence and Duty of him during his Life.

In the Canon and Civil Law it signifies him that hath the Gift of a Benefice; and the Reason is, Because the Gift of Churches and Benefices belonging unto such good Men as either built, or else endowed them with some great part of their Revenue.

PATROUILLE, or *Patrouil*, as we generally pronounce it, is a Round of Soldiers, to the Number of Five or Six, with a Serjeant to command them: These set out from the *Corps de Garde*, and walk round the Streets of a Garrison, to prevent Quarrels, Mischief, &c. and to keep all in Order, Peace and Quietness.

PAUPER. See *Forma pauperis*.

PAUSE or *Rest*, in Musick, is a Silence or Artificial Intermittion of the Voice or Sound, proportioned to a certain Measure of Time, by the Motion of the Hand or Foot.

These *Pauses* or *Rests* are always equal to the Length or Quantity of the Notes whereto they are annex'd, and are therefore called, by the same Names, as a *Long-rest*, *Breve-rest*, *Semi-breve-rest*, &c.

Odd Rests are those which take up only some part of a *Semi-breve's* Time or Measure, and have always reference to some *Odd Note*: for by those two Odds the Measure is made even.

PAUNCH, or *Panch*, is those Mats made of Sinnet, which in a Ship are made fast to the Main and Fore-yards, to keep them from galling against the Masts.

PAWLE, in a Ship, is a small piece of Iron bolted to one End of the Beams of the Deck, close to the Capstan, but yet so easily as that it can turn about. Its Use is to stop the Capstan from turning back, by being made to catch hold of the Whelps: Therefore they say, *Heave a Pawle!* That is, Heave a little more for the Pawle to get hold of the Whelps: And this they call *Pawling the Capstan*.

PAYING. The Seamen call laying over the Seams of a Ship a Coat of hot Pitch, *paying her*; which when 'tis done with Canvass, is called *Parcelling*. Also, when after she is *Graved*, and her Soil burned off, a new Coat of Tallow and Soap, or one of Train-Oil, Rosin and Brimstone, boiled together, is put on upon her, that is called *Paying of a Ship*. They say also sometimes, when in tacking about, a Ship's Sails being backstay'd, fall all flat against the Masts and Shrouds, *she is payed*.

PEAN, in Heraldry, is when the Field of a Coat of Arms is *Sable*, and the Powderings are *Or*.

PECTEN *Arboris*, is the Grain of the Wood of any Tree.

PECTINEUS, is a Muscle of the Thigh; so called from its Beginning at the *Os Pubis* or *Pelvis*. It has a thick, broad, and fleshy Origination from the External part of the said Bone, between the *Psoas Magnus* and the *Iliacus Internus*, and second Head of the *Triceps*; and descending obliquely backwards, it becomes a flat strong Tendon near its Implantation to the Asperity on the Posterior part of the *Os Femoris*, immediately below the lesser *Trochanter*, at the Insertion of the *Psoas Magnus* and *Iliacus Internus*.

This acting together with the *Psoas Magnus* and *Iliacus Internus*, doth not only draw the *Os Femoris* upwards, but direct it outwards, by its Curve Descent from its Origination to its Insertion at the Posterior part of the *Os Femoris*; which is a Provident Contrivance of Nature in walking, since the Thigh-Bones by their oblique Position do thereby render the Toes liable to turn inwards.

PECTINIS, or *Pubis Os*, the Share-Bone, is the lower and inner, or fore-part of the *Os Innominatum*; and even before, is joined to its Fellow by a Cartilage, called *Synchondrosis*, which is much thicker, but looser and softer in Women than in Men; for in Women, one Bone can a little recede from the other in Travail, to make way for the *Fetus*. It has a very large *Foramen* between the *Sinus* of the *Coxendix*, and that part whereby it is joined to its Fellow, making room for two Muscles of the Thigh; and above this *Foramen* is a *Sinus*, by which the Crural Veins and Arteries pass to the Thighs. The Upper part of this Bone is called its *Spina*, into which the Muscles of the *Abdomen* are inserted.

PECTORALS, or *Pectoral Medicines*, are such as are used in Diseases of the Breast, by attenuating, or thickning, or allaying the Heat thereof, and render the Matter which causes coughing, fit to be expectorated or spit out. *Blanchard*.

PECTORALIS, a Muscle of the Arm, so called from its Situation. This hath a broad semicircular

circular fleshy beginning above, from near half the Inferior part of the *Clavicula*: Below, from the *Os Pectorale*, and all the Cartilaginous Endings of the Six superior Ribs, and from the Bony part of the Seventh, it hath a distinct *Fasciculus* of fleshy Fibres, (which sometimes is confounded with the *Obliquus Descendens Abdominis*.) From this large Origin it marcheth transversely, and becometh narrower but thicker, and lessens it self as it passeth over the upper part of the *Biceps Cubiti*, and is inserted by a short, but broad, strong Tendon, to the Superior part of the *Os Humeri*, above the Termination of the *Deltoides*: The Fibres of this Muscle decussate each other, near their Implantation to the *Os Humeri*; those of the Superior part running downwards, and those of the Inferior marching up, intersect the former in Acute Angles. When it acts it moves the Arm either obliquely upwards, or directly forwards, or obliquely downwards, according to the various Direction of its *Series* or *Fibres*.

PECULIAR, signifies a particular Parish or Church that hath Jurisdiction within it self, for *Probat* of Wills, &c. exempt from the Ordinary, and the Bishops Courts.

The King's Chapel is a Royal *Peculiar*, exempt from all Spiritual Jurisdiction, and referred to the Visitation and immediate Government of the King himself, who is Supreme Ordinary.

It is an Ancient Privilege of the See of *Canterbury*, That wheresoever any Mannors or Advowsons do belong to it, they forthwith become exempt from the Ordinary, and are reputed *Peculiar*s.

PEDESTAL, in Architecture, is that part which supports a Pillar or Column, having its proper Base and Cornice different, according to the several Orders of Architecture.

The *Tuscan Pedestal*, being the most simple of all, hath only a *Plinth* for its Base, and an *Astragal* crown'd for its Cornice.

The *Dorick Pedestal*, (according to *Palladio*) borrowing the *Attick* Base, ought to have for its Height $2\frac{1}{2}$ Diameters of the Column taken below. But no *Pedestals* to this Order are seen among the Ancient Buildings.

The *Ionick Pedestal* is Two Diameters and about Two thirds high.

The *Corinthian Pedestal* hath the Fourth part of the Column for its Height, being divided into Eight parts; whereof one must be allowed for the *Cymatium*, two others for the Base, and the rest for the Dye or Square.

The *Composite Pedestal* ought to have the Third part of the Pillar for its Height.

PEDICULARIS Morbus. See *Phthiriasis*.

PEDICULUS, in Botany, is the Foot-stalk of any Leaf, Flower, or Fruit.

PEDIMENT, a Term in Architecture; the same with *Fronton*, which see.

PEDIUM. See *Tarsus*.

PEDRERO, or, as it is usually called by the Seamen, *Petterero*, is a small piece of Ordnance, most used on board of Ships to fire Stones, Nails,

broken Iron, or Partridge-shot, on the Enemy, when he attempts to board you. Most of these are open at the Breech, and have the Chamber to take out, and to be loaded that way, and not at the Muzzle.

PEEK, a Sea-word, used in these Senses: An Anchor is said to be *a-peek*, when a Ship being about to weigh, comes so over her Anchor, that the Cable is perpendicular between the Hawse and the Anchor; and to bring the Ship thus, is called *Heaving a-peek*.

They say also, *Peek the Miffen*; that is, Put the Miffen-yard right up and down by the Mast.

A Ship is said to *Ride a-peek*, where she lies with her Main and Fore-yards hoisted up; and then having one end of the Yards brought down to the Shrouds, the other is raised up an end: And this is done to contrary Sides; (*i. e.*) the Star-board Yard-arm of the Main-yard comes down to the Starboard side, and so doth the Larboard end of the Fore-yard; so that the Yards appear a cross each other like *St. Andrew's Cross*. The Way to do this, is, To let go the Starboard Top-sail-sheets from the Main-yard; and then topping up the Larboard-lifts: And so quite contrary for the Fore-yard.

To *Ride a-broad peek* is much after the same manner, only the Yards are raised up but half so high.

The Reason why they thus *peek* up their Yards is, lest lying in a River (and they hardly ever use it but then) with their Yards a-cross, another Ship should be foul upon them, and break their Yards.

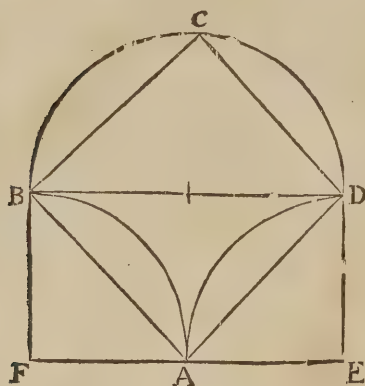
There is also a Room in the Hold of a Ship, that is called the *Peek*: 'Tis from the Bitts forwards to the Stern. Here Men of War keep their Powder; and Merchant-men, Outward-bound, place their Victuals here.

PEGASUS, a Constellation in the Northern Hemisphere, containing 23 Stars.

PEIRCED. When any Ordinary or Charge, in Heraldry, hath an Hole in it, so that the Field appears through, they say that Ordinary or Charge is *pierced*.

PELAGIÆ, is a Term used by the Writers of Natural History, to express such Sea Shell-fishes, as never or very rarely are found near the Shores, but always reside in the Deep, in those parts of the Bottom of the Sea which are most remote from Land.

PELICOIDES, is the Name given by some to the Figure B C D A, contained under the two



inverted Quadrantal Arks AB and AD , and the Semi-circle BCD , whose Area is $=$ to the Square AC , and that to the Rectangle EB .

'Tis equal to the Square AC , because it wants of the Square on the Left Hand the two Segments AB and AD , which are equal to the two Segments BC and CD , by which it exceeds it on the Right Hand.

PELIDNUS, is a Black-and-blue Colour in the Face, frequent in Melancholick Men.

PELLETS, a Bearing in Heraldry. See *Balls*.

PELLICAN, is the Chymists Term for a kind of Double Vessel, used in Circulations. See *Double Vessels*.

PELLICLE, a little Skin. When any Solution in Chymistry is in a gentle Heat evaporated so long till a thin Skin or Film arise on the top of the Liquor, 'tis call'd an *Evaporation to a Pellicle*; and then there is very little more Liquor left than what will just serve to keep the Salts in Fusion.

PELVIS, is the Place at the Bottom of the Belly, wherein the Bladder and Womb are contained.

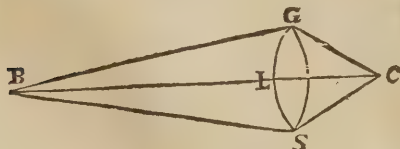
PELVIS Aurium. See *Cochlea*.

PELVIS Cerebri. See *Choana*.

PELVIS Renum, is a Membranous Vessel or Receptacle in either Kidney, which receives the Urine, and pours it into the Bladder.

PEMPHIGODES Febris, is a Spotted Fever; some say a Windy or a Flatulent Fever.

PENCIL of Rays in Opticks, is a double Cone of Rays joined together at the Base; one of which hath its Vertex in some one Point of the Object, and the Glass GLS for its Base; and the other hath its Base on the same Glass, but its Vertex in the Point of Convergence, as at C .



Thus: $BGSC$ is a Pencil of Rays, and the Line BLC , is called the Axis of that Pencil.

PENINSULA, in Geography, is a Portion of

Land, which being almost surrounded with Water, and is joined to the Continent only by an *Isthmus*, or narrow Neck of Land; as *Africa*, the greatest *Peninsula* in the World, is joined to *Asia*; that of *Morea* to *Greece*, &c.

PENETRATION of *Dimensions*, is a Philosophical way of expressing, That two Bodies are in the same Place, so that the Parts of one do every where penetrate into, and adequately fill up the Dimensions or Places of the Parts of the other; which is manifestly impossible, and contradictory to Reason.

PENUMBRA, in Astronomy, is a faint kind of Shadow, or the utmost edge of the perfect Shadow, which happens at the Eclipse of the Moon; so that it is very difficult to determine where the Shadow begins, and where the Light ends.

PENDANTS of a Ship, are of two kinds.

1. Those long Colours, or *Streamers*, cut pointing out towards the end, and there divided into two parts, and which are hung out at the Heads of the Masts, or at the Yard-Arm ends, are called *Pendants*; and are used for shew, and sometimes for Distinction of Squadrons.

2. That short Rope is called a *Pendant*, which at one end is fastened to the Head of the Mast, or to the Yard, or to the Clew of the Sail, and at the other end hath a Block and Shiver, to reeve some running Rope into. Thus the *Pendant* of the *Tackle* is made fast to the Head of the Mast; and the *Pendants* to the *Back Stays* are fastened to, and hang down on the Inside of the *Shrouds*. Also all the Yard-Arms, except the *Miszen*, have of these *Pendants*, into which the *Braces* are reeved.

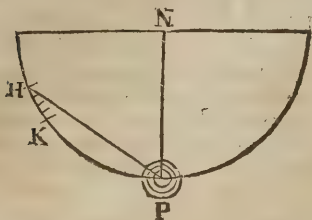
PENDULUM, is a Weight hanging at the end of a String, Chain, or Wire, by whose *Vibrations* or *Swings* to and fro, the Parts or Differences of Time are measured.

The Velocities of *Pendulums* in their lowest Points are as the Chords of the Arks they fall from or describe.

Thus if the *Pendulum* NP be let fall from the Height H , its Velocity at P will be expounded by the Chord HP . (In the Figure following.)

'Tis said that *Ricciolus* was the first that attempted to measure Time by the *Pendulum*, and therein he was followed, tho' near about the same time, by *Langrenus Vendelinus*, *Mersennus*, *Kircherus*, &c. some of which declare they knew nothing of *Ricciolus's* Attempt: But the first that applied it to a Movement, Clock, or Watch, was *Mr. Christopher Hugens*, and who brought it also to a good degree of Perfection.

The Learned Sir *Isaac Newton*, in his Accurate Experiments on *Pendulums*, found that the Matter of all Bodies is exactly proportionable to their Weight.



If the Pendulum P, be let fall from the Height H, and then at its return that way come up again as far as K, the Ark HK represents the Retardation arising from the Resistance of the Air.

The shorter Arks any Pendulum describes, the equaller will the Vibrations be to one another; and when the Arks are exceeding small, the Vibrations will be nearly equal as if the Pendulum did swing in a Vacuum. Wherefore it seems to be a Mistake in those who admire a Clock or Watch for its Pendulums swinging far, or taking a great Compals as they call it.

PENDULUMS, *Mersennus* found the length of a Pendulum that would swing Seconds to be 3 Feet 6 Inches, and since 'tis agreed that in our Latitude, it is just 39 Inches, 2 Tenths.

A Pendulum of 10 Inches, wanting about one Tenth of an Inch, will very near swing half Seconds, or the 120th part of a Minute of Time; which is 7200th part of an Hour.

The Lengths of Pendulums (which are always accounted from the Centre of Oscillation, to the Centre of the Ball or Bob) are to each other in a Duplicate Proportion of the Times in which their Vibrations are respectively performed; or are as the Squares of the Vibrations performed in one and the same time, Wherefore the Times must be in Subduplicate Proportion to the Lengths. Sir Isaac Newton demonstrates, Cor. 2. Prop. 34. Princip. That if the Force of the Movement of a Clock required to keep a Pendulum in Motion, could be so compounded with the gravitating force of the Pendulum, that the whole Force or Tendency downwards, shall be as the Line which arises by dividing the Rectangle under the Semi-ark of the Vibration and the Radius, is to the Sine of that Semi-ark, then all the Oscillations shall still be made in the same space of Time.

PROBLEMS.

I. To find the Length of a Pendulum which shall make any Assigned Number of Vibrations in a Minute.

Let the Number of Vibrations be 50, the Length of a String counted from the Point of Suspension, to the Centre of Oscillation, or of the Bullet or Round Ball at the end of it, is required.

Since the Lengths of Pendule's are to each other as the Squares of their Vibrations. And that a Pendule Vibrating Seconds (or 60 times in a Minute) is by Experience found to be of the length of 39 Inches and $\frac{2}{3}$ of an Inch.

I here use Sir *Jonas Moor's* Computation.

Say, as the Square of 50, (which is 2500): to

the Square of 60 (which is 3600) :: So is 39, 2 : to the Length of the Pendulum required; which will be found to be 56, 4 Inches. See the Work.

As 2500 to 3600 :: to 39, 2 to

39,2
7200
32400
10800

25 | 00 14112 | 00 (56,4

125

161

150

112

100

12

But for ready Practice; since in these Questions the Product of the mean Terms will always be 1411200 (that is the Product of the Square of 60 Multiplied by 39,2.) i.e. $3600 \times 39,2$. You need only divide that Number by the Square of the Number of Vibrations assign'd, and the Quotient will give the Length of a Pendulum, that shall Vibrate just so many times in a Minute.

PROBLEM II.

The Length of a String and Plumbet being known (reckoned as before from the Point of Suspension to the Centre of the Weight;) To find the Number of Vibrations such a Pendulum shall make in a Minute.

This is the Reverse of the former Problem; therefore say, As the Length given suppose 56,4, to the Length of the Standard Pendulum swinging Seconds, viz. 39,2. So is the Square of the Vibrations of the Standard Pendulum to the Squares of the Vibrations sought. See the Work.

As 56,4 : 39,2 :: 3600 : 2500, as will be found by working the Golden Rule as before. And the Square Root of 2500, will be 50, the Number of Vibrations sought.

But for use (here as in the former Problem) you need only to divide 1411200 by the Length, and it gives the Squares of the Vibrations, as there you divided by the Square of the Vibrations to find the Length.

USE.

And these two Problems may be of excellent use, both to regulate the Motion of a Clock or Watch, and exactly to measure Time without either; which may gratifie and assist the Curious in observing Eclipses, especially those of the *Satellites of Jupiter*, and in the Transits of the Moon under the fix'd Stars, and her Occultations of them: Whose Duration may be thus easily measured, without Clock, Watch, or any such way of distinguishing Time.

As for Instance, Suppose you were on a Journey or Voyage, or some place where you cannot have

have the conveniency of a good Clock or Watch, &c. and yet you would willingly observe the Duration of an Eclipse; which by your Table you know will happen such a Night, and near such a time of it.

Hanging up a String and Weight on a fine P.n. and letting it swing just at the Entrance of the Shadow on the Moon's Orb; let a Correspondent or Servant carefully count the Vibrations, and marking them down with a Pencil, or some such way; (moving the *Pendulum* dexterously also that way that 'tis going, when 'tis almost at rest, by a gentle push of his Hand, and by that means keeping it in constant Motion;) the Number of the Vibrations will be known, during the whole Eclipse; which note down on a piece of Paper, and measuring exactly the Length of your String in Inches, and Decimal parts of an Inch: Divide (by this Problem) 1411200 by the Length of your *Pendulum*, and the Quotient will afford you a Number, whose Square Root is the Number of Vibrations, the *Pendulum* you employ'd made in one Minute. Divide therefore the Number of all the Vibrations, during the whole time of Observation, by 60, and the Quotient will be the Number of Minutes the Eclipse lasted.

N. B. 'Twill be best to use a pretty long String, because the Vibrations being by that means slower, they may be the more distinctly counted. If at such a time you are furnished with a good Foot Rule, you may let your *Pendulum* be just 39, 2, and then each Vibration will be a Second: But if you are destitute of such an Advantage, you may, as before, hang up a *Pendulum* at a venture, and by another String, or some such way, taking its exact Length, you may keep it by you, with the Number of all the Vibrations, and compute the Time afterwards at your Leisure.

PROBLEM III.

To find the Length of any String which hath a Weight hanging at it, without coming to measure it; or without making use of any Quadrant, or such like Instruments, to take Heights.

Let the String and Weight annex'd be made to swing; and at the same time hang up a *Pendulum* of any known Length, (as suppose a Yard) and let it vibrate likewise, so that both the *Pendulums* may swing together; to effect which, you must let the *Pendulum* you hang up go away just when the other you would measure is beginning to make any Vibration: This done, stay till the *Pendulum* you hang up hath made a Competent Number of Vibrations (as suppose about 50 or 60;) and let a Correspondent count how many Vibrations the *Pendulum*, whose length is sought, made in the same time: And let us suppose, that That made 10 Vibrations while your String and Plummer made 60; since, as was said before, The Lengths of *Pendulums* are to each other as the Squares of their Vibrations: If you divide 3600 (the Square of 60) by 100, (the Square of 10) the Quotient will be 36, which will shew you that the String sought was 36 times as long as that which you hung up; i. e. was in length 36 Yards, or 108 Foot.

And thus you may easily find the height of any Church or Theatre, by means of a Branch-Can-

dlestick which hangs from the Roof: For it you hang up a String and Plummer of a Yard long, suppose, (or of any known length) and make this Candlestick and your *Pendulum* begin to swing both together (which is easily done by the help of a Correspondent:) The Vibrations that the Candlestick makes, while your *Pendulum* makes any Competent Number, will easily help you to the Length of the String or Wire, that holds the Candlestick, and consequently the height of the Church will be known likewise.

As in the former Example, Suppose the Candlestick made 10 Vibrations, while your *Pendulum* of a Yard made 60; then it is 36 Yards, or 108 Foot from the Centre of the Candlestick, to the end of the Rope or Wire that holds it to the Roof; to which, adding the height of the Centre of the Candlestick above the Ground, you have the whole height of the Church.

PROBLEM IV.

According to these Principles and Experiments on *Pendulums*, it will not be difficult to estimate nearly the Depth of a deep Well, by the fall of a Stone into the Water from the Mouth: Or the Distance that any Ship at Sea, or that any Fort is off, by the Time between seeing the Flash of the Powder, and hearing the Report of the Gun: Or the Distance that any Thunder-Cloud is off, &c.

For Sir Isaac Newton hath found that a Sound moves 968 Feet in a Second of Time.

'Tis asserted also by Mr. Hugen, and now generally agreed to, That a heavy Body descends in the first Second of Time after its beginning to fall, very near 16 Feet.

An Example to find the Depth of a Well, may serve for all.

Suppose you hang up a short *Pendulum*, that will vibrate Quarter Seconds, (the way to find its Length hath already been shewn) and letting go the Stone and the *Pendulum* together, you find the *Pendulum* hath made 16 single Vibrations before you hear the noise of the Stones fall into the Water. Then since 16 Quarters of a Second are equal to 4 Seconds, if you account the Acceleration of the Descent of heavy Bodies to be either as the Squares of the Times, or as the Encrease of the odd Numbers, either way will give you the Number 256 for the Depth of the Well.

For since, as it is elsewhere shewn, a Body descends 16 Feet in the first Second of Time, in the fourth Second it will descend 16 times 16 Feet; for the Times being 1 and 4, the Descent will be as their Squares; that is, as 1 to 16: Wherefore Multiplying 16 by 16, you have 256, the Depth of the Well.

Or, if according to Galileus's way, you account 16 Feet for the first Second, and then 3 times 16 for the next Second, 5 times 16 for the third Second, and 7 times 16 for the fourth Second; all these Numbers added together, will make 256, the Depth as before.

Indeed some Abatement must be allowed for the Time the Noise of the Stones fall into the Water takes to reach the Ear. Wherefore since a Sound moves 968 Feet in a Second, and 256 is a little more than $\frac{1}{4}$ of that Number, a little more than

than $\frac{1}{4}$ of 16 Foot must be taken out of the former found Depth 256. So that the Depth of the Well may roundly be accounted 250 Feet.

But in the other Estimations of the Distance of a Cloud, Ship, or Fort, there needs no such Allowance; and the bare Multiplication of 968, by the Number of Seconds between the Flash and the Report, will give the Distance of the Cloud or Ship from the Observer.

That Night, (*viz.* April 12.) on which our late Mighty Monarch King William was buried, we counted oftentimes very accurately, That the Distance between seeing the Flash, and hearing the Report of the Tower Guns, (which were then fired very solemnly and distinctly) was always 7 Seconds of Time. Multiplying then 968 by 7, it produces 6775, which is to be accounted the Distance between Amen-Corner and the Tower of London; which is one Mile, and 1495 Feet, or something more than a Mile and a Quarter.

PENDULUMS Royal, are those Clocks whose Pendulum swings Seconds, and goes eight Days, shewing the Hour, Minutes, and Seconds.

The Numbers of such a Piece are calculated thus:

First, Cast up the Seconds in 12 Hours, and you'll find them to be $43200 = 12 \times 60 \times 60$. The Swing-wheel must needs be 30, to swing 60 Seconds in one of its Revolutions: Now let $\frac{1}{2} 43200 = 21600$ be divided by 30, and you'll have 720 in the Quotient, which must be broken into Quotients; the first of them must be 12 for the Great Wheel, which moves round once in 12 Hours. 720 divided by 12, gives 60, which may also be conveniently broken into two Quotients, as 10 and 6, or 5 and 12, or 8 and $7\frac{1}{2}$; which last is most convenient: And if you take all your Pinions 8, the Work will stand thus:

8)	96	(12
8)	64	8
8)	60	(7 $\frac{1}{2}$

39

According to this Computation, the Great Wheel will go about once in 12 Hours, to shew the Hour, if you will; the Second Wheel once in an Hour, to shew the Minutes; and the Swing-wheel once in a Minute, to shew the Seconds.

PENNATA folia, winged Leaves, is a Term among the Botanists, for such Leaves of Plants as grow directly one against another on the same Rib or Stalk; as those of *Ash*, *Wail-nut-tree*, &c.

PENSION, that which in the two Temples is called a *Parliament*, and in *Lincoln's-Inn* a *Council*, is in *Gray's-Inn* termed a *Pension*: That is, An Assembly of the Members of the Society, to consult of the Affairs of the House. Also in the Inns of Court, *Pensions* are certain annual Payments of each Member to the House, for certain Occasions.

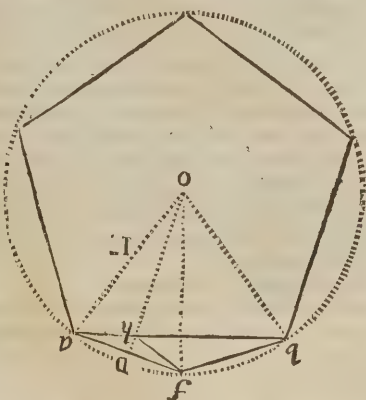
PENSION Writ, when a *Pension Writ* is once issued, none sued thereby in the Inns of Court shall be discharged, or permitted to come into Commons, till all Duties be paid.

PENSION Order in *Grays-Inn*, seems to be a peremptory Order against such of the Society as are in Arrear for *Pensions*, and other Duties.

PENTAGON, in Geometry, is a Figure having five Sides, and five Angles: If all the Sides are equal, and consequently the Angles, 'tis called a *Regular Pentagon*.

PROPOSITION.

The Side *a b* of a Regular Pentagon, or which can be inscribed in a Circle, is in Power equal to the Side of an Hexagon and Decagon, inscribed in the same Circle: That is, The Square of *ab*, is equal to the Sum of the Squares of *af* and *ao*.



Let *ao*, the Side of the Hexagon, be called *H*; and *af* (that of the Decagon) be called *D*; and *ab* be called *P*.

I say $PP = HH \times DD$.

For the Angle at the Centre *boa* being 72 Degrees, the equal ones, *b* and *a*, in the same Triangle, must be 54 Degrees each. Bisect then the Angle *foa* by the Prick'd Line *ob*; and then 'tis plain the Angle *bob* will also be 54 Degrees, (*i.e.* $36 + 18$ Degrees,) and consequently the $\triangle abo$ and $ob b$ are similar. Wherefore $ab : bo :: bo : bb$ (*i.e.* in

our Notation, $P : H :: H : \frac{HH}{P}$.)

Again, In the $\triangle bfa$, the Angles *b* and *a* are $=$; and also in the little $\triangle fba$, the Angle $f = a$; and consequently the $2 \triangle bfa$: and fba , are Similar; and consequently $ba : af :: af : ab$. That is, $P : D :: D : \frac{DD}{P}$.

Wherefore of the whole Line *ba*, the 2 Parts are found to be by this Notation, $\frac{HH}{P}$ and $\frac{DD}{P}$;

That is, the whole is $\frac{HH + DD}{P}$, but this

Line *a b* is $= P$: Wherefore $PP = HH + DD$. *Q. E. D.*

PENTANGLE, a Figure having five Angles.

PENTAPOTES, (in Grammar,) are such definite Nouns as have but five Cases, as *Nemo*.

PERACUTUM *Menstruum*. See *Menstruum Peracutum*.

PERAMBULATION of the Forest, is the Surveying or Walking about the Forest, or the Limits of it, by Justices, or other Officers thereto appointed, to set down the Meres and Bounds thereof, and what is within the Forest, and what without.

PERAMBULATIONE *facienda*, is a Writ that is sued out by two or more Lords of Manors lying near one another, and consenting to have their Bounds severally known. It is directed to the Sheriff, commanding him to make *Perambulation*, and set down their certain Limits.

PERAMBULATOR, or *Walking-wheel*, is an Engine made of Wood or Iron, commonly half a Pole in Circumference, with a Movement, and a Face divided like a Clock, with a long Rod of Iron or Steel, that goes from the Centre of the Wheel to the Work: There are also two Hands, which (as you drive the Wheel before you) count the Revolution; and from the Composition of the Movement, and by the Division on the Face, shew how many Yards, Poles, Furlongs, and Miles, you go. The Use of this Instrument is to measure Roads, Rivers, and all Level Lands, with great Expedition.

PERAVAYLE. See *Paravayle*.

PERCEPTION, is the clear and distinct Apprehension of any Object offered to us, without forming any Judgment concerning them.

PERCH, a Measure, by our Statute Law, of 16 Foot and a half in Length. See *Pole*.

PERDONATIO *utlagarie*, is a Pardon for him who, for Contempts in not coming to the King's Court, is out-law'd, and afterwards of his own Accord, yieldeth himself to Prison.

PEREMPTORY, in Law, signifies a final and determinate Act, without Hope of renewing or altering.

PERFECT *Concords*, in Musick. See *Concords*.

PERFECT *Fifth*, the same with *Diapente*; which see.

PERFECT Numbers, are such whose aliquot or even Parts, join'd together, will exactly return the whole Number, as 6, 28, &c. For of six, the half is three, the third Part two, and the sixth Part one, which added together, make six; and it hath no more aliquot Parts in whole Numbers: So twenty eight, which has these Parts, viz. 14, 7, 4, 2, and 1, exactly return 28; which therefore is a Perfect Number, whereof there is but ten between one and one Million of Millions.

PERFORANS, is a Muscle of the Fingers, so called because its Tendons run thro' those of the *Perforatus*; it's also called *Profundus* from its Situation; and *Tertii Internodii Digitorum Flexor*, from its Use. It riseth fleshy from near two Thirds of the Superior and Forepart of the *Ulna*, as also from the Ligament between the last named Bone and the *Radius*; and becoming a large thick belied Muscle, grows outwardly Tendinous, before it passes over the *Pronator Radii Quadratus*, and is divided into four round Tendons, which march under those of the *Perforated Muscle*, beneath the *Ligamentum Transversale*; from each of these Tendons the *Musculi Lumbricales* are said to arise, after which they pass thro' the *Fissures* of those of the *Perforated Muscles*, and proceeding over their Ex-

tremities, terminate in the Superior and Forepart of the third Bone of each Finger.

The Tendons of this Muscle running through those of the *Perforated*, is a no less useful than stupendous Artifice in Nature. For to the End the Fingers (like so many Leavers) should be bended with great Force, it is absolutely necessary the strongest Muscle should be inserted nearest their Extremities, and farthest from their *Fulcimenta* the *Ossa Metacarpi*: But in regard every Internode should be attended with a particular Muscle, the better to accommodate them to various Employments, and the Origination of the Superior or *Perforatus*, is confined to the *Apex* of the Internal Exuberance of the *Os Humeri*, and upper Part of the *Radius* only; wherefore could not be a fit Instrument for so strenuous an Action, and that not only in regard to its Magnitude, but by the Approach of its two Extrems when the *Cubiti* or *Carpus* are bended; both which would be no small Impediments in divers Actions; it's therefore necessary it should be employed in the Motions of the second Internodes: But since these Superior Tendons would be hereby liable to interrupt the Inferior in their right Progress to the Extremities of the Fingers; it seems an Argument of great Counsel in transmitting the latter through the *Fissures* of each of the former, whereby the Actions of both are not only distinctly performed, and the Extremities of the Fingers attended with the largest Muscle, (whose Origin is below the *Os Humeri*, wherefore its Extrems cannot approach in the Flexion of the *Cubiti*;) but their Motions are preserved, tho' the Superior Muscle is totally divided; which indeed is a provident Contrivance of the Author of Nature, and is in it self sufficient to excite our Admiration.

PERFORANS, a Muscle of the lesser Toes; so called, because its Tendons run thro' the *Fissures* in the Tendons of the *Musculus Perforatus Pedis*: It is also called *Flexor tertii Internodii Digitorum Pedis*, from its Use. It hath an acute fleshy Origination from the Backpart of the *Tibia*, immediately under the *Musculus Subpopliteus*, having a double Order of Fibres united in a middle Tendon like the *Flexor Pollicis Longus*, but ceaseth to be fleshy as it passeth behind the *Malleolus Internus*, and running in a Channel over the Internal Part of the *Os Calcis*, under it, Imbanding Ligaments in half its Progress thro' the Sole of the Foot; it is divided into four Tendons, which march thro' the Perforations of the Tendons of the *Perforatus Pedis*, and are inserted to the third Bone of every lesser Toe.

PERFORATUS, is a Muscle belonging to the Fingers; and so called, because its Tendons are Perforated to admit those of the *Perforating Muscles* to pass thro' them to their Insertions: It is also called *Sublimis*, from its Situation, being above the *Perforating Muscles*; and *Flexor secundii Internodii Digitorum*, from its Use: It riseth Tendinous from the Internal Exuberance of the *Os Humeri*, between the *Flexores Carpi*: It also has a disgregated fleshy Origination from the Forepart of the *Radius*, between the *Pronator Radii Teres* and *Flexor Pollicis Magnus*, composing a fleshy Belly, lessens it self in less than half its Progress, where it's divided into four fleshy Portions, each of which soon becomes so many roundish Tendons, which are included in their proper Mucilaginous Membrane as they pass under the *Ligamentum*

trum Transversale Carpi thro' the Palm; near the first Internode of the Fingers each Tendon is divided to admit those of the Perforated Muscle thro' them; then joining and subdividing again immediately before they are inserted to the Superior Part of the second Bone of each Finger.

PERFORATUS Pedis, is a Muscle of the lesser Toes; so called, because its Tendons are Perforated like those of the Fingers. It is also called, *Flexor secundi Internodii Digitorum Pedis*, from its Use; and *Sublimis* from its Situation. It springeth from the Inferior and Internal Part of the *Os Calcis*, between the *Musculi Abductores* of the greater and lesser Toes, dilating it self to a Flethy Belly: After it hath passed the Middle of the *Planta Pedis*, it is divided into four Flethy Portions, which becoming so many Tendons, are divided near their Terminations, to admit the Tendons of the *Perforans* to pass thro' them to their Inferiors: These being united again, pass underneath them to their Implantations at the upper Part of the second Bone of each lesser Toe.



PERFORATED, *i. e.* bored thro'. The Armourists use it to express the passing or penetrating of one Ordinary (in part) thro' another; as thus:

He beareth Or, a bend Ermine Perforated thro' a Chevron Gules. But when there is only a Hole made thro' the Ordinary, and nothing in it to fill it up, they call it *Piercing*.

PERIAMMA, called also *Periapia*, is a Medicine, which being tied about the Neck, is believed to expel Discaes, especially the Plague. See *Appensa*.

PERIAPTUM. *Vid. Periamma*.

PERICARPIUM, is a Medicine applied to the Wrists, to cure an Ague, &c.

PERICARDIUM, is a double Membrane which surrounds the whole Substance of the Heart, and contains a Liquor to Moisten, Lubricate, and, as some say, to Refrigerate the Heart: It hath five Holes, according to the Number of Vessels which go out of the Heart. It adheres to the *Mediastinum* at the Basis, and at the *Mucro* to the Centre, or Nervous Part of the *Diaphragma*.

PERICRANIUM, is a Membrane which infolds the Skull, seated next to the *Periostrium*, covering the whole Skull, except just where the Temporal Muscles lie. It is of exquisite Sense; and causes intolerable Pain when the Temporal Muscle is wounded.

PERIÆCI, are those Inhabitants of the Earth who live under the same Parallels, but under opposite Semi-circles of the Meridian, whence they have the same Seasons of the Year, *viz. Spring, Summer, Autumn, and Winter*, at the very same Time, as also the same Length of Days and Nights; for 'tis in the same Climate, and at an equal Distance from the Equator: But the Changes of Noon and Midnight, are alternate one to the other.

PERIGÆON, or *Perigeum*, is a Point in the Heavens, wherein a Planet is said to be in its nearest Distance possibly from the Earth.

PERIHELION, is that Point of a Planet's Orbit, wherein it is nearest to the Sun.

PERIMETER, is the Compass or Sum of all the Sides which bound any Figure, whether *Rectilineal* or *Mix'd*.

PERINDE Valere, a Term belonging to the Ecclesiastical Law, signifying a Dispensation granted to a Clerk, that being defective in his Capacity to a Benefice, or other Ecclesiastical Function, is *de Facto* admitted to it: And it hath the Appellation from the Words, which make the Faculty as effectual to the Party dispensed with, as if he had been actually capable of the Thing for which he is dispensed with at the Time of his Admission. It is called a *Writ*.

PERINÆUM, is the Ligamentous Seam betwixt the *Scrotum* and the Fundament.

PERIOD, is a Full-stop at the End of any Sentence. A *Period* in Numbers, is a Distinction made by a Point or Comma after every sixth Place or Figure; and is used in *Numeration* for the readier distinguishing and naming the several Figures or Places: Which how to do, see under *Numeration*.

PERIOD, in Chronology, signifies a Revolution of a certain Number of Years; as the *Metonick Period*, the *Julian Period*, and the *Calippick Period*: Which see in their proper Places.

PERIODICAL, is the Term for whatever performs its Motion, Course, or Revolution, regularly, so as to return again, and to dispatch it always in the same Period or Space of Time. Thus the *Periodical Motion* of the Moon, is that whereby she finishes her Course round about the Earth in a Month; and this is in 27 Days, 7 Hours, 45 Minutes; and is called, The Moon's

PERIODICAL Month; which is the Space of Time that the Moon finishes her Revolution in.

PERIODUS Sanguinis, is a continued Circulation of the Blood thro' the Body; which is thus made: The Blood is carried out of the Arteries by Fibres, either of the Fleth or of the Entrails, or the Membranous Parts, saith *Blanchard*; but 'tis certain it is by Capillary Arteries continued with the like small Veins into the Mouth of the greater Veins; and implanted in them, as we see, many other little Channels in the Veins; so the Blood, passing thro' these out of the Arteries, is presently sent to the Veins, that it may be carried back again to the right Ventricle of the Heart; and thence by the Arterious Vein to the Lungs; in which after the Blood has been accended by some Nitrous Particles, breathed in thither by the Air, it goes into the Venous Artery, thence into the left Ventricle of the Heart; which again empties it self into the *Aorta*, or Great Artery; so that the Body may be nourished and enlivened, it goes into every Part of it. This is *Blanchard's* Account of the Matter. See more in the Word *Circulation of the Blood*.

PERIOSTIUM, is a Thin Membrane that incloses immediately almost all the Bones in the Body, except the Teeth, Bones of the Ear, &c. It hath a most exquisite Sense, and probably is an *Expansion* of the Nervous and Tendinous Fibres of the Muscles. Its Use is to cover the Bones, and to sustain the Vessels which enter into them to nourish them. *Dr. Havers* in his Excellent Book, called, *Osteologia Nova*, saith, That this Membrane consists of two Sorts of Fibres, of which those that lie next the Bone, are derived from the *Dura Mater*, and the others from the Tendons of the Muscles.

PERIPATETICK Philosophy, is named from those, who from their Action of Walking while they Studied or Taught were called,

PERI.

PERIPATETICKS. The Chief of these was *Aristotle*; then his Successors; among whom you may reckon *Theophrastus*, *Cratippus*, *Boethius*, and all his very numerous Interpreters. But about 460 Years ago, there arose a new Set of Famous *Aristotelians*, which were called also *Peripateticks*; from them came the three chief Sects of the *Peripatetick Philosophy*. The *Thomists* from *Thomas Aquinas*, who flourished A.D. 1224. The *Scotists* from *Johannes Dun Scotus*, A.D. 1308. And the *Nominalists* from *Ocham*, who was born about A.D. 1310. And now a days by the *Peripatetick Philosophy*, we understand that which was founded on the Principles of *Aristotle* and his Commentators and Followers; and which therefore is as frequently called, *The Aristotelian Philosophy*.

PERIPHERY, in Geometry, is the Circumference of a Circle, or of any other Regular Curvilinear Figure.

PERIPHRAIS, is a Circumlocution used to avoid certain Words, whose Idea's are unpleasing; and to prevent the speaking of something that would produce ill Effects.

PERIPEUMONIA, is an Inflammation of the Lungs and Breast, accompanied with a sharp Fever, hard Breathing, a Cough, and an heavy Pain. *Blanchard*.

PERITERE, in Architecture, is a Place encompassed round with Columns, and with a kind of Wings about it; here the Pillars stand without, whereas in the *Peristyle* they stand within.

PERISCHII, are the Inhabitants of the two Frozen Zones, or those that live within the Compa's of the *Arctic* and *Antarctic* Circles; for as the Sun never goes down to them after he is once up, but always round about, so do their Shadows. Whence the Name.

PERISSOLOGY, is a Discourse fill'd up with unnecessary and superfluous Words.

PERISTALTICK Motion, is a *Vermicular* or *Wormlike* Motion of the Intestines, whereby the Excrements are voided. Also the Motions of the Vessels, whereby Humours, as Water, Chyle, the Blood, &c. ascend and descend, is sometimes so called.

PERISTIPHALINUS, *internus* & *externus*, are Muscles of the *Uvula*, the one pulling it forwards, and the other backwards.

PERISTYLE, in Architecture, is a Place or Building encompass'd with Pillars, standing round about within the Court: But this Word *Peristyle* is sometimes taken for a Row or Rank of Columns, as well without as within any Edifice; as in Cloysters and Galleries: Sometimes this was called *Antiprostyle*.

PERITONÆUM, is a Membrane (of an Oval Figure) which clothes the whole *Abdomen* on the Inside, and its Entrails on the Outside: It consists of two Tunicks, and adheres above to the *Diaphragma*, below to the *Os Ilium*; before to the Transverse Muscles, but chiefly to their Tendons about the *Linea Alba*; behind, it grows to the Flethy Heads of these Muscles.

PERITROCHIUM, in Mechanicks is a kind of Wheel, or Circular Frame of Wood, placed somewhere upon an *Axis*, or Cylinder, round which a Rope is wound, in order to raise a Weight; and the Use of this *Peritrochium*, is to make the Cylinder or *Axis* be turned the more easily by the Means of Staves or Levers, which

are fix'd in its Circumference. See *Axis* in *Peritrochio*.

PERJURY, is a Crime committed, when a lawful Oath is ministred by any that hath Authority, to any Persons in any Judicial Proceedings; who swear absolutely and fally in a Matter material to the Issue or Cause in Question, either of their own Accord, or by the Subordination of others. *Note*, If a Man call me *Perjured Man*, I may have my Action upon the Case; but for calling me a *Forsworn Man*, no Action lies. And *Pejury* is excepted out of the Act of General Pardon.

PERMEATING, is penetrating into, and passing thro' the Pores of any Body. Mr. Boyle had a *Smoking Liquor*, which he called, *The Permeating Menstruum*, and its Operations, *The Penetrant*, or *Permeating Fumes*. It was made of equal Parts of *Flos Sulphuris*, *Sal Armoniack*, and good Quick Lime, all powdered, and well mingled together, and then distilled by Degrees of Fire in a Retort, till the Sand which contains the Retort, become almost red-hot; for then will come over a Liquor which will be continually smoking, and consequently must be kept well stop'd. With this Fuming Liquor he made several Experiments to evince the Porosity of Bodies; by discovering, that tho' Coins, &c. were wrap'd up close in Leather, &c. yet the Fumes of this *Permeating Menstruum* would get thro' them, and discolour the Metal. *Vid. Essay of Porosity of Body*, p. 36, 37.

PERMUTATIONE *Archidiaconatus* & *Ecclesie eidem annexæ cum Ecclesia* & *præbenda*, is a Writ to an Ordinary, commanding him to admit a Clerk to a Benefice, upon Exchange made with another.

PER my & *per toute*, in Law, a Joint-Tenant is said to be seised of the Lands that he holds jointly *Per my* & *per tout*; that is, he is seised by every Parcel, and by the whole.

PERNIO, is a preternatural Swelling, caused by the Winter Cold, especially in the Hands and Feet, which at last breaks out.

PERONA, is also called *Fibula*, because it joins the Muscles of the Leg; whence the first and second Muscle in the Leg is called *Peroneus*. It is the less and slender Bone, which is fastened outwardly to the greater Bone of the Leg, called *Tibia*.

PERPENDICULUM *Chronometrum*, the same with the *Pendulum*.

PER que *Servitia*, is a Writ Judicial, issuing from the Note of a Fine, and lieth for Cognisee of a Mannor, Seigniori, chief Rent, or other Services, to compel him that is Tenant of the Land at the Time of the Note of the Fine levied, to Attorn unto him.

PERQUISITE, is any Thing gotten by a Man's own Industry, or purchased with his own Money, different from that which descends to him from his Father or Ancestors.

PERQUISITES of Court, in Law, signifies those Profits that grow to a Lord of a Mannor, by virtue of his Court Baron, over and above the certain yearly Profits of his Land, as Fines of Copyholds, Harlots, Amerciaments, Waifes, Strays, &c.

PERSICK Order of Architecture, is where the Bodies of Men serve instead of Columns to support the *Entablature*, or rather the Columns are in that Form.

The Nile of it was this; *Pausanias* having defeated the *Persians*, the *Lacedaemonians*, as a Mark of their Victory, erected Trophies of the Arms of their Enemies, and then represented the *Persians* under the Figures of Slaves supporting their *Porches*, *Arches*, or *Houses*.

PER MINIMA, a Term used in Chymistry and Physick, expressing the perfect Mixture of any two or more Bodies: *v. gr.* If Silver and Lead be melted together, they will mingle and be united with one another *per minima*: That is, all the smallest Particles of one Metal will be mingled and united with those of the other.

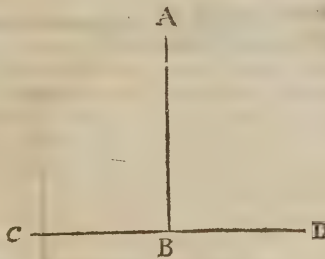
PERNICITY, a Word used by some Philosophick Writers of *Celerity*, or extraordinary swiftness of Motion.

PERONÆUS primus, a Muscle of the *Tarsus*, by some it is called *Longus*, it being the first that offers it self to view, and the longest Muscle seated on the *Fibula* or *Os Perone*.

It arises Externally Tendinous, and Fleishy Internally from above half the Superior part of the said Bone, and marching somewhat backwards, becomes a strong, flat Tendon, four Fingers breadth in length above the Inferior Appendage of the said *Fibula*, called *Malleolus Externus*; passing behind which in a Channel, like a Rope in a Pulley; and from thence being inflected forwards, together with the Tendon of the following Muscle, they pass under an imbanding Ligament as they run over the *Os Calcis*, but this Tendon declining from its Companion, matches over the *Os Cuboides*, under the *Musculus Abductor Minimi Digiti*, and over the *Ossa Cuneiformia*, in the Bottom of the Foot, and under the Tendons and Muscles bending the Toes, and is Inserted to the Superior and Hindmost part of the *Os Metatarsi* of the Great Toe. The Tendon of this Muscle being conveyed over the Hindmost part of the *Malleolus Externus*, as on a Pulley, is an Elegant Contrivance in Nature, whereby the Ball of the Great Toe (as that part is commonly called to which it is Inserted) is directed towards a Perpendicular bearing of the Weight of the Body on the Leg, in standing on Tip-toe, by pulling the Foot and Toes somewhat outwards.

PERONÆUS secundus, a Muscle of the *Tarsus*, by some called *Semi-fibularis*: It has an Acute Fleishy beginning above the middle of the External part of the *Fibula*, under the Fleishy Belly of the *Peroneus primus*; it also continues its Fleishy beginning from the Posterior sharp edge of the said *Fibula*, and becoming a Fleishy Belly, grows Tendinous as it runs under the *Malleolus Externus*, together with the Tendon of the *Peroneus primus*, and is Inserted to the Superior and External part of the *Os Metatarsi* of the Little Toe. The proper Action of this Muscle, is to pull the Foot and Toes outwards.

PERPENDICULAR, in Geometry; when a Right Line standeth so upon another, that the Angles on either side are equal; then this Right Line which so standeth erected, is *Perpendicular* to that upon which it standeth.



Thus: The Line AB, is Perpendicular to the Line CD, when the Angles on either side are equal: That is, If the Angle $ABC =$ to the Angle ABD , and either of these Angles is equal to a Right one.

A Right Line is said to be

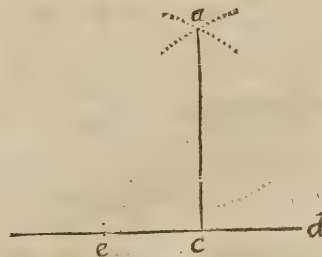
PERPENDICULAR to a Plane, when 'tis Perpendicular to all the Lines it meeteth with in that Plane.

One Plane is

PERPENDICULAR to another, when a Line in one Plane is Perpendicular to the other Plane.

PROBLEM I.

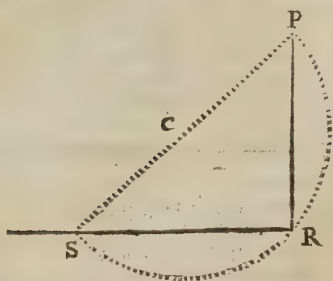
To Erect a Perpendicular on any assigned Point of a given Right Line. As suppose on the Point *c*.



On each side of the given Point *c*, cut off $ce = cd$; and with the Distance *de*, (or any other greater than *dc*) describe two Arches from *d* and *e*, intersecting each other in *a*, join *ac*; which shall be the Perpendicular required. *11* *Euclid*.

PROBLEM II.

To Erect a Perpendicular, on, or near the End of a given Line. As suppose at R.

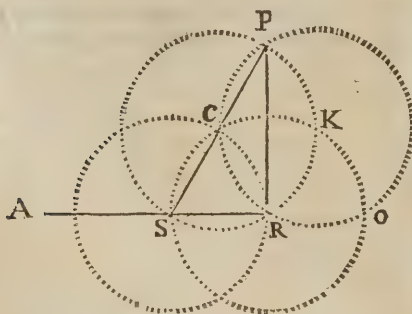


Open your Compasses to any convenient distance, and setting one Foot in C, draw the Circle P R S. Lay a Ruler from S, thro' C, it will find the Point P in the Circumference; from whence draw P R, and 'tis done.

For the Angle P R S, being in a Semi-circle, must be a Right one; (by 31 *è* 3 *Eucl.*) and consequently P R must be Perpendicular to S R.

The same may be otherwise performed thus:

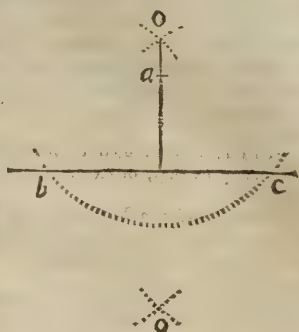
Suppose on A R, the Perpendicular P R were to be Erected at the End R.



With any convenient opening of your Compasses, one Foot being placed in R, draw the Circle O C S; then with the same Distance, set one Foot in S, and cross the Circle in C, as also in K; then on the Centres C and K, draw (with the same Distance) two more Circles cutting each other in P; I say P R, will be Perpendicular to A R. For the Angle P R S, is a Right one, being in the Semi-circle P K R S.

PROBLEM III.

To let fall a Perpendicular on a given Line, from a given Point. As a



Set one Foot of the Compasses in a the Point given, and with the other cross the given Line in the Points b and c: Then setting the Compasses in b and c, draw two Arks, crossing each other below in o: Then lay a Ruler from a to o, and 'tis done.

The Demonstration depends on the 9th *è* 1 *Euclid.*

PERPENDICULAR, or *Right Plane*, is where a *Plane*, (like a well made Wall) inclines and leans on one side, no more than it doth on the other.

PERPENDICULAR, to a Parabola, is a Right Line cutting the Parabola in the Point in which any other Right Line touches it, and which is also its self Perpendicular to that Tangent.

PERPETUAL *Caustick*. See *Infernal Stone*.
PERPETUITY, a Term used in Law, where an Estate is so designed to be settled in Tail, &c. that it cannot be undone or made void.

PER SE, a Term of Art often used; as in Logic, we say a Thing is considered *Per se*, when 'tis taken in the Abstract, and without Connexion with other things, which would confound the Notion, and hinder its being clear.

In Chymistry a Thing is said to be Distilled *Per se*, when 'tis without the usual Additaments of other things with it.

We say also a Man performs any Action, or Executes any Office *per se*, when he doth it himself in Person, and not by a Deputy or Substitute.

PERSEUS, a Constellation in the Northern Hemisphere, consisting of 38 Stars.

PERSONAL Verb, in Grammar, is one that is Declined or Conjugated with all the Three Persons, and in both Numbers; whereas an *Impersonal Verb* is only used in the Third Person Singular.

PERSONABLE, in Law, signifies as much as enabled to maintain Plea in a Court, thus: The Defendant was adjudged Personably to maintain his Action. Also the Tenant pleaded, that the Wife was an Alien Born in Portugal, without the Allegiance of the King; and Judgment was demanded, Whether he should be answered: The Plaintiff saith, She was made Personable by Parliament;

liament; that is, as the *Civilians* would speak it, *Habere personam standi in judicio*. *Personable* is also as much as to be of Capacity to take any thing granted or given.

PERSONAL, in Law, when 'tis join'd with the Substances, Things, Goods, or Chattels; as Things *Personal*, Goods *Personal*, Chattels *Personal*, signifies any moveable Thing belonging to a Man, be it quick or dead: Thus, they say, Theft is an unlawful Felonious Taking-away another Man's moveable *Personal* Goods.

PERSONAL Tythes, are Tythes paid of such Profits as come by the Labour of a Man's Person, as by Buying and Selling, Gains of Merchandize and Handicrafts, &c. See *Tyther*.

PERSONALITY, is an Abstract of *Personal*: the Action is in the *Personality*, viz. It is brought against the right Person, or the Person against whom in Law it lies.

PERSONS *ne Prebendaries ne seront chargeés as quinsim*, &c. is a Writ that lies for *Prebendaries*, or other Spiritual Persons, being distrained by the Sheriff or Collectors of Fifteens, for the Fifteenths of their Goods, or to be contributory to Taxes.

PERSPECTIVE, is that Part of the Mathematicks which give Rules for the representing of Objects on a plain Superficies, after the same Manner as they would appear to our Sight, if seen thro' that Plain, it being supposed as transparent as Glass.

Perspective is either *Speculative* or *Practical*.

Speculative Perspective, is the Knowledge of the Reasons of the different Appearance of certain Objects, according to the several Positions of the Eye that beholds them.

Practical Perspective, is the Method of Delineating that which is apparent to our Eyes, or that which our Understanding conceives in the Forms that we see Objects. See Vol. II.

PERSPECTIVE Lincal, is the Diminution of those Lines in the Plan of a Picture, which are the Representation of other Lines very remote.

PERSPECTIVE Aereal, is a proportional Diminution of the Tints and Colours of a Picture, when the Objects are supposed to be very remote.

PERSPECTIVE Military, is when the Eye is supposed to be infinitely remote from the Table or Plain.

PERSPICUOUS, is that which is clear and transparent, as that the Light may be seen freely thro' it. See *Diaphanous*.

PERSPIRATION, a breathing through, as Sweat through the Invisible Pores of the Body.

PERTICA, a Sort of Comer, the same with *Veru*.

PESSARY, is an Oblong Medicine, which being made of the Length of the Middle-Finger, is thrust up into the Neck of the Womb, and is good against several Diseases incident to it.

PESSULUS, the same with *Pessary*.

PESSUS, the same.

PESTILENTIAL Fever, is that which does not only afflict the Patient with a bare Distemper or Heat arising from Putrefaction, &c. but also with a Malignant and Venomous Quality. It differs from the Plague, as a Species or Sort from the Genus or Kind; because a *Pestilence* may sometimes happen without a Fever. *Blanchard*.

PESTOLOIDES, is a Sort of Urine which seems to have little Leaves or Scales in it. *Blanchard*.

PETALA, is a Term in Botany, signifying those fine coloured Leaves that compose the Flowers of all Plants. And from hence Plants are distinguished into *Monopetalous*, whose Flower is all in one continued Leaf; and *Tripetalous*, and *Pentapetalous*, when the Flower consists of three or five Leaves; and *Polypetalous* when of many, without determining the Number.

PETARD, in Fortification, is an Engine of Metal in the Form of an High-crown'd Hat, with narrow Brims, which being filled with very fine Powder, well primed, and then fix'd with a *Madder* or Plank, bound fast down, with Ropes running through Handles, which are round the Rim of the Mouth of it, to break down Gates, Port-cullices, Draw-bridges, Barriers, &c. This Engine is from 7 to 8 Inches deep, and 5 broad at the Mouth; the Diameter at the Bottom or Breech is an Inch and a half, and the Weight of the whole Mass of Metal is from 55 to 60 Pounds, generally requiring about 5 Pounds of Powder for the Charge. They are also used in Countermines to break through into the Enemies Galleries, and to disappoint their Mines.

PETECHIALIS, is a Malignant Fever, called also *Pulcaris*, because it makes the Skin look as tho' it were Flea-bitten.

PETIGO. See *Lichen*.

PETIT Cape. See *Cape*.

PETIT Larceny. See *Larceny*.

PETIT Treason, in Common Law, is when a Servant kills his Master, a Wife her Husband, a Secular or Religious Man his Prelate or Superior, to whom he owes Faith and Obedience: In how many other Cases it may be committed, see *Crompt. Justice of Peace*.

PETITIO Principii, *Begging of Principles*, is a precarious supposing a Thing to be true, or taking it for granted, when it really remains either dubious, or else is expressly denied. This frequently is called *Begging the Question*, when a Man supposes what he should prove.

PETREFACTION, is properly the changing of a mix'd Body into a Stoney Substance, when it had no such Nature before; and the Action by which this is performed, is called,

PETREIFICATION, and the Thing so chang'd is said to be *Petrefied*. 'Tis justly questionable, Whether there be any such Thing as *this* in Nature, or not? *Petrefaction* indeed now-a-days is a mighty modish Word, for every Thing almost that is found upon the Surface, or dug out of the Earth, passes with some Persons by this Name. But what is there that really and truly deserves the Name of *Petrefaction*? When the *Petrefying* Waters, as they are called, (which are nothing but Waters impregnated with a great deal of Stoney Matter, which in their Passage through the Earth became dissolved in them:) When these, I say, incrustate Rushes, Grass, or Stricks, all over with a Stoney Coat, by letting the Stoney Particles dissolved in them by little and little fall down upon and adhere to them; or, it may be, insinuate into their Pores, and deposit themselves there. And when after this the Vegetable Part inclosed rots and moulders away, and the Stoney Coat or Substance daily increases; this is not the Transmutation of a Vegetable Substance into a Stoney

or Mineral one; and therefore the new Body thus formed, is not properly a *Petrification* in the true Sense of the Word.

And when many Bodies are found in the Earth, which by all possible ways of judging and distinguishing, approve themselves to be Animal or Vegetable Bodies, such as the Shells, Teeth, Bones, of Animals, the Fossil-Trees, Pine-Cones, Hazel-Nuts, &c. which are every where found deep in the Earth. It appears odd to call these *Petrifications*, and more odd to suppose them nothing but the *Sportings of Nature*; and to affirm all these Things to be nothing but meer *Formed Stones*, only because we cannot account presently how they came thus into the Earth, or solve all the Objections or Difficulties about them. But every one will have his own way of Expression.

PETROSUM Os, is the Internal Process of the Bones of the Temples, so called from its Hardness and Cragginess: 'Tis pretty long, jutting out to the Inner Basis of the Skull, within which it hath two Holes, and thro' one of them an Artery, and thro' the other the Auditory Nerve passes to the Inner Cavities of the Ear, that are excavated in this Process, viz. the *Tympanum*, *Labyrinthus*, and *Cochlea*; and without the Skull it hath three Holes: The first of which is the *Meatus Auditorius*: The second is narrow, short, and oblique, near to the first, and thro' it the Jugular Vein enters the Inner Cavities: The third is seated betwixt the *Processus Mamillaris*, and the *Styloides Appendix*, and ends in the Passage which goes from the Ear to the Mouth.

PETTERERO. See *Pedrero*.

PEVETTS, are the Ends of the Spindle of any Wheel in a Watch; and the Holes into which they run, are called *Pevett-Holes*.

PEYNT fort & dure. See *Payne fort & dure*.

PHACIA. Vid. *Lenticula*.

PHACOS, is a Spot in the Face like a Nit, whence it is called *Lenticula* and *Lentigo*.

PHAGADÆNA, is an exulcerate Cancer.

PHAGADENICK Water, is made by dissolving a Dram of Sublimate Corrosive in a Pound of Lime-Water, on which it will immediately turn Yellow.

PHALACKOSIS, is the falling off the Hair.

PHALANGOSIS, is a Fault of the Eye-lids, when there are two Rows of Hair, or when the Hair grows inward and offends the Eyes.

PHALANX, according to some Writers, is the Order and Rank observed in the Finger-Bones.

PHANTASY is an Internal Sense or Imagination, whereby any Corporeal Thing is represented to the Mind, or impressed on the Brain by its proper Image.

PHANTASTICAL Colours, are such as are exhibited by the Rainbow, Triangular Glass Prism, the Surface of very thin *Muscovy* Glass, &c. They had this Name given 'em by the *Peripatetick Philosophers*, who supposed them to be no real Colours. This *Kircher* well refutes in his *Mundus Subterraneus*, Part 2. p. 13, 16. and shews also the Cause of such Colours.

PHARMACEUTIC, the same with *Pharmacum*.

PHARMACOPOEA, is the Doctrine or a Description of Things Medicinal, in order to cure Diseases.

PHARMACUM, is any Sort of Medicine against a Disease.

PHARMACY, is an Art of collecting, chusing, and compounding Medicines, viz. the Apothecary's Art; to which may also be added the Chymical Analysis of Bodies, in order to prepare good Medicines out of them.

PHARYNGETRUM is sometimes used for the *Pharynx*, sometimes for the Bone *Hyades*.

PHARYNX, is the upper Part of the Gullet, consisting of three Pair of Muscles; to which some add another, making the Number seven: It is continued to the *Fauces*, (or indeed is the greatest Part thereof,) reaching up behind to the *Uvula*, on the Sides to the *Tonsillæ*, and before to the *Epiglottis*: It is *Membranous*, but not entirely so, being in some Places *Carnous* and *Thick*. Three Pair of its Muscles open it in the Action of swallowing; and the odd one is a *Sphincter* which serves to straiten it.

PHÆNOMENON, in Natural Philosophy, signifies any Appearance, Effect, or Operation of a Natural Body, which offers its self to the Consideration and Solution of an Enquirer into Nature.

PHASES, signifies the Appearance or the Manner of Things shewing themselves, and therefore in Astronomy is used for the several Positions in which the Planets, (especially the Moon) appear to our Sight; as obscure, horned, half illuminated, or full of Light, which by the help of a *Telescope* may likewise be observed in *Venus* and *Mars*,



PHEONS, in Heraldry are the Barbed Heads of Darts or Arrows, and are usually of this Figure.

Sable, a Fesse Ermine between three Pheons, by the Name of *Egerton*.

PHILANTHROPY, is a generous Love for Mankind in general, or an Inclination to promote Publick Good.

PHILONIUM, is an Opiate Medicine; of which they reckon two Sorts, the *Philonium Romanum* and *Persicum*.

PHILOSOPHICAL Egg, among the Chymists is a thin Glass Vessel, or Bubble, of the Shape of an Egg, with a long Neck or Stem: 'Tis used in long Digestions.

PHILTRUM, is the Hollow Dividing the Upper Lip.

PHIMOSIS, is the same with *Paraphimosis*; also the Inversion of the Eye-lids through an Inflammation.

PHLEBORHAGIA, is the breaking of a Vein.

PHLEBOTOMY, opening of a Vein, or letting of Blood.

PHLEGM, or *Water*, the Fourth of the Five Chymical Principles. See *Water*.

The Insipid Water that comes first in the Distillation of Acid Spirits, the Chymists call the *Phlegm*: And the more any such Spirit is rectified, that is, distilled over again, to draw off still more of this *Phlegm*, they say 'tis the better *dephlegmated*.

PHLEGM of Vitriol, is the Moisture that is first drawn off when *Calcined Vitriol* is distilled, in order to get its Spirit and Oil, it comes off with a gentle Heat.

PHLEGMAGOGUES, are Medicines which purge or drain away that Humour which they call *Phlegm*.

PHLEGMON,

PHLEGMON. So the Surgeons call an hot Tumour, proceeding from an Over-affluxion of Blood to any Part.

PHLEGMONODES *Febriis*, a Fever with an Inflammation of the Blood.

PHLOGOSIS, is a light Inflammation of the Eyes, with a small Pain and Redness; which sometimes turns into a true *Ophthalmia*, and is the Original thereof.

PHLYCTOENA, is a Pimple in the Skin, also a little Ulcer, like a Bubble or Bladder, in the Corneous Tunick of the Eye, and proceeding from a sharp watry Humour. *Blanchard.*

PHONICKS, the same with *Acousticks*; which see.

PHOSPHORUS, a Chymical Preparation, which being expos'd to the Light or Air, will shine in the Dark. Of this there are several Kinds whose Process shall be briefly delivered.

To make the *Bolonian Phosphorus*, see under the *Bolonian Stone*.

The most common Way (with us) is to make the *Phosphorus* from Humane Urine. And the Hint came first by Chance thus:

One *Brand*, an Alchymist of *Hamburg*, wisely thinking to find the Philosopher's Stone in Human Urine, work'd upon it in a Retort, and so forced over the *Phosphorus* Matter; yet he would not communicate this Discovery to any one, and so the Secret died with him. After his Death, one *Kirkbelsius*, a *Saxon* Chymist set himself to find it out, (having heard of such a Thing,) and succeeded accordingly; and this Man shew'd the Process to several of his Friends.

The Honourable Mr. *Boyle* having (in part) had an Account of this *Phosphorus*, from one *Daniel Kraff*, a *German*, about the Year 1680, published in *English* an Account of the Way of making this *Phosphorus*, and several very Curious Experiments upon it, under the Title of *Noësiluca*. And since that, Mr. *Homburg* hath writen largely about it, as you may see in the Memoirs (for the Months *March* and *April*) of the Royal Academy of Sciences at *Paris*, 1692.

The Way of Preparing it, is this:

Take a good large Quantity of the New-made Urine of Beer-drinkers, and evaporate it gently, to the Consistence of Honey: Then put it in an Earthen Vessel, cover, and place it in a Cellar for three or four Months, that it may thoroughly ferment and putrefie. Then mix a double Quantity of Sand, or Powder of Pots, with one part of this corrupted Urine, and put it into an Earthen Retort or Glais one Coated; and fitting it to a large long-neck'd Glais Receiver, in which was before put two or three Quarts of Water, distil it in a naked Fire, in a Reverberatory Furnace, gently at first, for about two Hours; afterwards augment the Fire gradually, 'till all the Volatil Salt and black Fœtid Oil be drawn off. Then raise the Fire to the highest Degree, and white Clouds will come into the Receiver, and fix it by little and little, on one Side of it, in the Form of a yellowish Skin, and another Part will precipitate to the Bottom in Powder. Keep the Fire thus violent for three Hours, 'till no more Fumes will come. Let all cool, and unlute the Vessels; and

throwing more Water into the Receiver, shake all well about to loosen what will stick to the Sides; and then pour it all into a large Glais Vessel, where it will settle; the Volatile Salt will dissolve in the Water, but the *Phosphorus* and the Oil will sink to the Bottom. Pour off the Water, and gathering the remaining Matter together, put it into a little Glais Vessel, with a little fresh Water, and digest it in a Sand-heat, stirring the Matter about from Time to Time with a Wooden Spatula; the *Phosphorus* by this Means will separate from the Oil, and sink to the Bottom. Pour away the Oil, and make the *Phosphorus* up while hot, into little Sticks or Pieces, which must be kept in a Viol of Water close stop'd.

This is the *Solid Phosphorus*, with which, if you write any Letters on Paper, or on a Wall, they will appear Luminous in the Dark, and continue so a good while. If you cut off a little Bit of it, and rub it strongly along a Piece of Paper with a Knife, it will actually enkindle the Paper.

The *Liquid Phosphorus* is made by digesting in Horse-dung a little Bit, or some Scrapings, of the Solid, for two Days, in Oil or Essence of Cloves, Oil of Turpentine, &c. For after it is dissolved in the Oil, it will impregnate it so, that as soon as ever you open the Bottle, the Matter will appear all in a Flame.

If you put a little of the *Solid Phosphorus* into a Viol, with a little Oil of Vitriol, that is very strong and well dephlegmated, and then add to it about half as much common Water as there was Oil of Vitriol, the Mixture will grow very hot, and smok; and if you carry the Viol into the Dark, you will see the *Phosphorus* enkindled, and sparkle in many Places of the Viol, like Meteors, or little Falling-stars: And if a small Quantity of Oil of Turpentine be added, it will produce an actual Flame.

Lemery mentions a New-invented *Phosphorus* of Mr. *Homburg's* being made of one Part of Sale Armoniack, and two of Quick-lime slack'd by the Air; which are fluxed together in a Crucible, into a kind of Gray Glais, which when it is struck with a Hammer, appears presently of a light Fire.

Phosphorus Balduini, called the *Hermetick Phosphorus*, is thus made:

Heat read-hot about two Pounds of Chalk, let it cool, and powder it. Then take a Pint of *Aqua-fortis*, and put into it a Spoonful of your powdered Chalk; a great Ebullition will arise: Repeat this 'till the throwing in of the Powder makes no Ebullition at all. After this, let the Liquor settle, and decant it into an Earthen Pan placed in Sand, and evaporate all the Liquor, so there will remain a kind of Salt at the Bottom. Put this Salt into a Coppel, or a strong Earthen unglazed Pan; set it in a gentle Sand-heat, and the Matter will swell. Continue this gentle Fire 'till it be sunk down a little towards the Bottom; then cover the Pan or Coppel with a Lid that hath two or three Holes in it, and encrease the Fire gradually, 'till it be strong enough to melt the Matter; and when 'tis melted, a yellow Vapour will exhale through the Holes in the Cover. Then take the Vessel presently off the Fire, and putting on another Earthen Lid, which hath no Holes in it, set it by to cool. Round about the

fides of the Pan you will find a Cruft of yellow Matter; that is the *Phosphorus*. It must be kept in a Box well stopp'd, in a dark place. When 'tis design'd to be render'd Luminous, you must expose it, like the *Bolonian Stone*, to the Light, for a small Space; and then removed into the Dark, it will shine there. If it be left in the Dark, exposed to the Air for about Fifteen Days, it will shine all that while; but after that go out, and never be Luminous more.

Mr. Boyle, in his *Aereal Noctiluca*, p. 102. describes a *Phosphorus Balduini* much like this; and in *Phil. Transf.* N° 199, there is of his a yet more accurate Process for this Thing.

The Learned Dr. Slare, in *Phil. Transf.* N° 150, makes an Ingenious Comparison between *Lightning*, and the Flashes which in warm Weather he had often observed (by Night) to arise from some Pieces of the *Solid Phosphorus*, kept in long Glass Bottles of Water about $\frac{2}{3}$ filled.

PHRENES. See *Diaphragma*.

PHRENESIS, the same with *Phrenitis*.

PHRENETICK Nerves, are those which are called also *Stomachick*, and spring from Dr. Willis's Eighth Pair, or from the common reckoned Six Pair: Those descend between the Membranes of the *Mediastinum*, and send forth Branches into them.

PHRENICK Vessels, are the Veins and Arteries that run through the *Diaphragm*, *Mediastinum*, and *Pericardium*.

PHRENITIS, or *Phrenzy*, is a Dotage with a continued Fever, often accompanied with Madness and Anger; proceeding from too much Heat in the Animal Spirits, not from the Inflammation of the Brain, as the Ancients thought. *Willis* thus defines it, namely, an Inflammation of the whole Sensitive Soul and Animal Spirits.

PHRICODES, is a dreadful Fever, in which Men are apt to fancy terrible Things.

PHROCYON, a Fix'd Star of the Second Magnitude, in the Constellation *Canis minor*, whose Longitude is 111 Degrees 23 Minutes, Latitude 15 Degrees 57 Minutes.

PTHARTICUM, is a Corrupting Medicine.

PTHIRIASIS, is the Lousy Disease; also a Scaly Scab on the Eye-brows. *Blanchard*.

PTHISIS, is a Consumption of the whole Body, rising from an Ulcer in the Lungs, accompanied with a slow continued Fever, ill scented Breath, and a Cough. *Blanchard*.

PTHOE, the same with *Phthisis*.

PHYGETHLON, is a Swelling proceeding from an Inflammation of the Glandules, wherein Nature expels something; as in the Plague, about the Groins. *Blanchard*.

PHILOSOPHERS Tree. See *Diana's Tree*.

PHYMA, is a Swelling: There are five Sorts, *Verrucae*, *Calli*, *Vari*, *Furunculi*, and *Hydrae*, or *Defudationes*; of which, see under those Words. Others reckon it a Tumour in the Glandules only, which quickly separates. *Blanchard*.

PHYEMA, an Inflammation in any part of the Body, as a Tympany. *Blanchard*.

PHYSICKS, or Natural Philosophy, is the Speculative Knowledge of all Natural Bodies, (and Mr. Lock thinks, That God, Angels, Spirits, &c. which usually are accounted as the Subject of *Metaphysics*, should come into this Sci-

ence,) and of their proper Natures, Constitutions, Powers, and Operations. See *Physiology*.

PHYSIOGNOMICKS, is a Term used by some Physicians and Naturalists for such Signs as are taken from the Countenance of Persons, to judge of their Dispositions and Tempers.

PHYSIOLOGY, *Physicks*, or Natural Philosophy, is the Science of Natural Bodies, and their various *Affections*, *Motions*, and *Operations*. This is either

General, which relates to the Properties and Affections of Matter or Body in general. Or,

Special and Particular, which considers Matter as formed or distinguished into such and such Species, or determinate Combinations.

PHYSIOLOGY, is by some also accounted a Part of *Physick*, that teaches the Constitution of the Body so far as it is found, or in its Natural State; and endeavours to find Reasons for its Functions and Operations, by the Help of Anatomy and Natural Philosophy.

Mr. Keil, in his *Introductio ad Physicam*, reckons Four Classes or Sorts of Philosophers which have treated of *Physicks* or Natural Philosophy.

1. Those who delivered the Properties of Natural Bodies under Geometrical and Numerical Symbols; as the *Pythagoreans* and *Platonists*.

2. The *Peripateticks*, who explained the Natures of Things by Matter, Form, and Privation; by Elementary and Occult Qualities; by Sympathies, Antipathies, Faculties, and Attractions, &c. And these did not so much endeavour to find out the true Reasons and Causes of Things as to give them proper Names and Terms; so that their *Physick* is a kind of *Metaphysics*.

3. The *Experimental Philosophers*, who by frequent and well-made Trials and Experiments, as by Chymistry, &c. sought into the Natures and Causes of Things: And to these almost all our Discoveries and Improvements are due; and much more would they have done, if they had not fallen into *Theories* and *Hypotheses*, which they forced oftentimes their Experiments to maintain, whether they could or not.

4. The *Mechanical Philosophers*, who explicate all the *Phenomena* of Nature by *Matter* and *Motion*, by the Texture of Bodies, and the Figure of their Parts; by *Effluvia*, and other subtle Particles, &c. And in short, would account for all Effects and *Phenomena* by the known and established Laws of *Motion* and *Mechanicks*: And these are, in Conjunction with the last named, *The Only True Philosophers*.

PIA Mater. See *Mater tenuis*.

PICA. See *Citta*.

PICATIO. See *Dropacismus*.

PIEDOUCHE, in Architecture, is a little Square Base smoothed, and wrought with Mouldings, which serves to support a *Base* or Statue drawn half way, or any small Figure in Relief.

PICKET, in Fortification, is sometimes used for a Stake, sharp at one End, to mark out the Ground and Angles of a Fortification, when the Engineer is laying down the *Plan* of it; these are usually pointed with Iron. There are also larger *Pickets*,

Pickets,

Pickets, which are drove into the Earth, to hold together *Fascines* or Faggots, in any Work cast up in haste. And *Pickets* also are Stakes drove into the Ground by the Tents of the Horse in a Camp, to tie their Horses to. And *Pickets* are also drove into the Ground before the Tents of the Foot, where they rest their Muskets or Pikes round about them in a Ring. When an Horseman hath committed some considerable Offence, he is often sentenced to stand on the *Picket*; which is, to have one Hand drawn up as high as it can be stretch'd, and then he is to stand on the Point of a *Picket* or Stake only with the Toe of his opposite Foot; so that he can neither stand or hang well, nor ease himself by changing Feet.

PICRA. See *Hiera picra*.

PIED-DROIT, in Architecture, is a Square Pillar, differing from a *Pillaster* in this respect, that it hath no Base nor Capital: It is taken also for Part of the Jaumbs of a Door or Window.

PIE-Powder-Court, is a Court held in Fairs, to yield Justice to Buyers and Sellers, and for Remedies of all Disorders committed in them.

PIGMENTS, are such prepared Materials as Painters, Dyers, &c. make use of, to impart to Bodies, or to imitate particular Colours. When Glass is stained or coloured, as in Painting on Glass, or for the Counterfeiting of Gems or Precious Stones, the *Pigment* is usually of a Metaline or a Mineral Nature.



PILE, in Heraldry, signifies an Ordinary, consisting of a Two-fold Line, formed after the Manner of a Wedge; being probably something like the Figure of the Roman *Pilum*, which was a tapering Dart, about five Foot long, and sharpened at the Point with Steel. The *Pile* is born *inverted*, engraved, &c. like other Ordinaries, and issues indifferently from any Point of the Verge of the *Escutcheon*.

He beareth a *Piles Gules*, by the Name of *Shandois*.

PILLAR, or *Column*, in Architecture, is one of the principal Things in which the Beauty and Proportion of a Fabrick doth consist. A *Pillar* hath three Parts, the *Pedestal*, the *Shaft* or *Pillar* it self, and the *Ornaments*: And each of these is again subdivided into three other Parts; the *Pedestal* hath its *Base*, *Dye*, and *Cornich*; the *Pillar* its *Base*, *Shaft*, and *Capital*; and the *Ornaments* have their *Architrave*, *Frieze*, and *Cornich*.

PILLASTERS, in Architecture, signify Square Pillars, that usually stand behind Columns to bear up Arches: They have the very same Dimension, Chapter, and Base, with the Columns, according to their several Order. When these *Pillasters* do not stand alone by themselves, they are usually made to jet out of the Wall, a third part or a quarter of their Breadth, with respect to the Variety of different Works: So that some of them project out only a sixth or an eighth part, and they are generally as broad at top as at bottom.

PILLOW, is that Piece of Timber in a Ship whereon the Boltspirit beareth or resteth at its coming out of the Hull, aloft, close by the Stem.

PINEALIS Glandula. See *Conarium*.

PINGUEDO, the same with *Adeps*, or the Fat of Animals. See *Adeps*.

PINION, in a Watch, is that lesser Wheel which plays in the Teeth of another. Its Notches (which are commonly 4, 5, 6, 8, &c.) are called *Leaves*, and not *Teeth*, as in other Wheels.

PINION of Report, is that *Pinion* in a Watch, which is commonly fixed on the Arbor of the Great Wheel, and in old Watches used to have commonly but four Leaves: It driveth the *Dial Wheel*, and carrieth about the *Hand*.

The Quotient or Number of Turns to be laid upon the *Pinion of Report* is found by this Proportion: As the Beats in one Turn of the Great Wheel, to the Beats in an Hour: So are the Hours of the Face of the Clock, (*viz.* 12 or 24) to the Quotient of the Hour-Wheel, or *Dial-Wheel*, divided by the *Pinion of Report*, *i. e.* the Number of Turns which the *Pinion of Report* hath in one Turn of the *Dial-Wheel*; that is, in Numbers.

26928 : 20196 :: 12 : 9.

Or rather thus:

As the Hours of the Watch's going, are to the Numbers of the Turns of the Fly :: so are the Hours of the Face, to the Quotient of the *Pinion of Report*.

If the Hours be 12, then 16 : 12 :: 12 : 9.

But if 24, the Proportion is 16 : 12 : 24 : 18.

N. B. This Rule may serve to lay the *Pinion of Report* on any other Wheel, thus:

As the Beats in one Turn of any Wheel to the Beats in an Hour :: so are the Hours of the Face, or *Dial-Plate* of the Watch, to the Quotient of the *Dial-Wheel*, divided by the *Pinion of Report* fixed on the Spindle of the aforesaid Wheel.

PINNA Auris, is the upper and broader Part of the Ear called the Wing.

PINNATA Folia, in Botany are such Leaves of Plants as are deeply jagged, cut, or indented in, and which have their Parts resembling Feathers.

PIONEERS, are such Kinds of Labourers as are taken up for use of an Army, to cast up Trenches, and undermine Forts.

PIPE, in Law, is a Roll in the Exchequer, otherwise called the *Great-Roll*. See *Clerk of the Pipe*.

PITHIAS, or *Pithites*, with some Writers, is the Name of a Comet, or rather Meteor, of Form of a Tub: Of these there are divers Kinds, *viz.* some of an Oval Figure, others like a Tun or Barrel set Perpendicular, and some like one inclined, or cut short off; others having a Hairy Train or Bush, &c.

PINTLES in a Ship, are those Hooks by which the Rudder hangs to the Stern-post.

PIN-Wheel. See *Striking-Wheel*.

PISCES, is the twelfth and last Sign of the *Zodiack*, being a Constellation consisting of 35 Stars.

PISCES

PISCES Meridianus, a Southern Constellation, containing 12 Stars.

PITUITA. Vid. Plegma.

PITUITARIA Glandula. Vid. Glandula Pituitaria.

PITIROIDES, a Settling in the Urinelike Branch. Blanchard.

PLACARD, is a License whereby a Man is permitted to shoot in a Gun, or use Unlawful Games.

PLACE, is that Part of Space which any Body takes up; and with relation to Space is either absolute or relative. As Mr. Lock observes.

PLACE also is sometimes taken for that Portion of Infinite Space, which is possessed by, and comprehended within the Material World, and which is thereby distinguished from the rest of the Extension.

PLACE is usually distinguished into *Internal Place*, which properly speaking, is that Part of Space which any Body takes up or fills; and *External Place*, which according to Aristotle, is determined by the Surfaces or Confines of the Adjoining or Ambient Bodies: But it is better divided into *Absolute*, which is the former *Internal Place*; and into *Relative Place*, which is the Apparent Secondary or Sensible Position of any Body, according to the Determination of our Senses, with respect to other Contiguous or Adjoining Bodies.

PLACE of Arms, when taken in the general, is a strong City which is pitch'd upon for the Magazine of an Army. But a

PLACE in Fortification usually signifies the Body of a Fortrels. And a

PLACE of Arms in a Garrison, is a large open Spot of Ground in the Middle of the City, where the great Streets meet, or else between the Ramparts and the Houses, for the Garrison to rendezvous in, upon any sudden Alarm, or other Occasion. And the

PLACE of Arms of a Trench, or of an Attack, is a Post near it, shelter'd by a Parapet or Epaulement, for Horse and Foot to be at their Arms, to make good the Trenches against the Sallies of the Enemy. These Places of Arms are sometimes covered by a Rideau or Rifing-ground, or else by a Cavin or Deep Valley, which saves the Trouble of fortifying them by Means of Parapets, Fascines, Gabions, &c. They are always open in the Rear, for their better Communication with the Camp. When the Trench is carried on as far as to the Glacis, they make it very wide, that it may serve for a Place of Arms. Also the

PLACE of Arms of a Camp, is a spacious Piece of Ground at the Head of the Camp, to draw out the Army in Order of Battle. But the

PLACE of Arms of a Troop of Horse, or of a Company of Foot in the Camp, is that Spot of Ground on which the Troops or Company draws out.

PLACE Geometrick, is a certain Bound or Extent wherein any Point may serve for the Solution of a Local or Indetermined Problem. All the Points of a Geometrick Place, have the same Relation to the Points of the Right Line correspondent thereunto.

PLACE Plane, is when the Point resolving the Problem, is in the Periphery of a Circle: And then 'tis called, *Locus ad Circulum*. Thus, v. gr.

A Circle and any one of its Diameters being given, to find a Point without it, but on the same Plane with it; from whence a Right Line being drawn to one of the Ends of the Diameter, that Line shall be bisected by the Circumference of the Circle.

PLACE simple, or *Locus ad Lineum rectum*, as the Geometers call it, is when the Point that resolves any Problem is in a Right Line. As, To find the Centre of a Circle, whose Periphery shall pass thro' the Ends of a Right Line given in Magnitude and Position: For such Centre will be in a Right Line. But a

PLACE Solid, is when the Point is in one of the Conick Sections: Thus, To find the Centre of a Circle which shall touch both a Line given in Position, and also another Circle given in Position and Magnitude: There must be a Point found in the Periphery of a Parabola, the Focus of which, is the Centre of the Circle given, when the given Line and Circle touch one another, Lastly, a

PLACE Sur-solid, is when the Point is in the Circumference of a Curve of an higher Gender than the Conick Sections; as having a Point and a Right Line given on a Plane, to find on that Plane another Point beyond that given Line; so that a Right Line drawn thro' those 2 Points, shall have its Part comprehended between the second Point and the given Line, also given it self.

PLACE of the Sun, Star, or Planet, is the Sign of the Zodiack, and Degree of it, which the Planet is in; or it is that Degree of the Ecliptick reckoned from the Beginning of Aries, which the Planets or Stars Circle of Longitude cutteth; and therefore is often called, The Longitude of Sun, Planet, or Star:

And 'tis found by this Proportion:

As Sine of Sun's greatest Declination is $23^{\circ} 30'$. — — — — — } 9.6006997

To Sine of this present Decl. $23^{\circ} 15'$ — 9.9963154

So is Radius — — — — — } 10

To the Sine of his Longitude $81^{\circ} 52'$ 9.9956157

Which if the Declination were North, will be in $20^{\circ} 52'$ of Gemini; but if the Sun had South Declination, his Place would be in $20^{\circ} 52'$ of Capricorn.

PLACENTA Uterina, called by some Hepar Uterinum, from its Colour, which is like that of the Liver, as it is also something in Substance: But it comes nearer to that of the Spleen. It is soft, and hath innumerable Fibres, and small Vessels, and its Parenchyma is Glandulous almost every where. In Women it is Circular, but with some Inequality in its Circumference; in the Middle it is about two Fingers thick, but is thinner towards the Edges, and is about a Span, or a quarter of a Yard over, from one Side to the other, when the Fetus is mature for the Birth: It is hollowed and smooth within, next the Fetus, and grows every where firmly to the Chorion; but without, next the Womb, 'tis very unequal, having many Protuberances, by which it adheres to the Womb, tho' to what Part of it, is not agreed. When there is more than one Fetus, 'tis sometimes double, treble, &c. and sometimes but one with so many distinct Partitions in it. It grows

grows not from the Womb originally, but its Rise is from the *Chorion*, which about the 9th Week, in Women, sends forth a downy Substance, which soon grows into Knobs, turns reddish, and then adheres to the Womb conspicuously, about the twelfth or thirteenth Week.

It hath Vessels from a double Original, some from the Womb, and some from the *Chorion*, immediately and mediately from the *Fetus*. From the Womb it receives Arteries, Veins, Nerves, and Lymphæducts; all which, tho' they be very large and conspicuous in the Womb, and even in that Place where the *Placenta* joins to it, yet they are but very small Capillaries in the *Placenta* itself, and are dispersed only thro' that Side of it which is next the Womb. The Vessels that come from the *Chorion* are Arteries and Veins; and, as Dr. *Wharton* saith, Lymphæducts also. From the *Fetus*, thro' the *Corion*, it receives the Umbilical Vessels of the *Fetus*: For the first Months of the Pregnancy it sticks most firmly to the Womb; but as the *Fetus* grows mature for the Birth, it loosens by Degrees, and at last, like ripe Fruit from the Tree, falls off from the Womb, and makes Part of the After-burden or Birth.

PLADAROSIS, are little soft Tumors which grow under the Eye-lids.

PLAIN Chart, is the Plat or Chart that Seamen sail by, whose Degrees of Longitude and Latitude are made of the same Length.

PLAIN Sailing, is the Art of finding all the Varieties of the Ship's Motion on a Plain, where all the Meridians are made Parallel, and the Parallels at Right Angles with the Meridians, and the Degrees of each Parallel equal to those of the Equinoctial; which, tho' notoriously false in itself, supposing the Earth and Sea to be a Plain Flat, and each Parallel equal to the Equinoctial; yet by laying down Places accordingly, and breaking a long Voyage into many short ones, a Voyage may pretty well be perform'd by it, near the same Meridian.

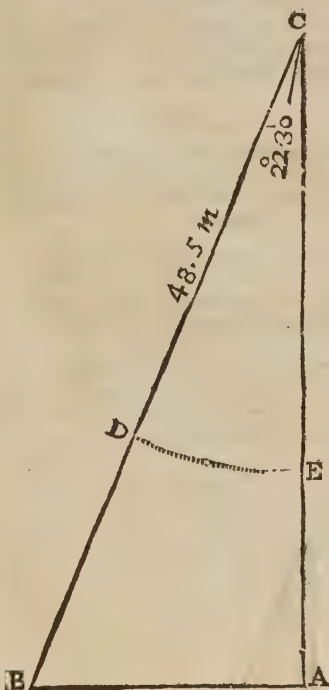
In *Plain Sailing* 'tis imagin'd, that by the *Rhumb-Line*, *Meridian*, and *Parallel of Latitude*, there always will be formed a Right-angled Triangle; and that so posited, as that the Perpendicular may represent part of the Meridian or North and South Line, containing the *Difference of Latitude*: The Base of the Triangle represents the *Departure*; and the Hypotenuse the *Distance sailed*; the Angle at the Top is the *Course*, and the Angle at the Base the *Complement of the Course*: Any two of which, with the Right Angle being given, the Triangle may be prorracted, and the other three Parts found: As in the following Examples.

CASE I.

The Course and Distance given, to find the Difference of Latitude, and Departure from the Meridian.

Admit a Ship from the Latitude $50^{\circ} 10'$ North, sails S. S. W. 43. 5 Miles: I require the Latitude she is in, and her Departure or Separation.

Geometrically.



Draw AC the South and North Line, and with 60 Degrees from the Line of Chords from C, (because the Ship sails Southward) describe DE, which make equal to 22 Degrees 30 Minutes the Course, and draw CB, which make also equal to 48.5 from any Line of Equal Parts: Then let fall from B, BA, perpendicular to the Meridian; so is the Triangle compleated, and the Lines CA, BA, may be measured from the same Scale.

By the Logarithms.

As the Radius	— — — — —	10.00000
Is to the Distance run, BC 48.5	— — — — —	1.68574
So is the Sine of the Course $22^{\circ} 30'$	— — — — —	9.58283
To the Departure Westing $18^{\circ} 56'$	— — — — —	1.26857

Then again:

As the Radius	— — — — —	10.00000
Is to the Distance BC 48.5 Miles	— — — — —	1.68574
So is Co-sine of the Course $S. 67^{\circ} 30'$	— — — — —	9.96561
To the Difference of Latitude 44.8	— — — — —	1.65135
From the Departed Latitude $50^{\circ} 10'$ North.		
Subtract the Difference of Lat. $00 45$		
Remainder is the present Latit. $49 25$		

By Gunter's Scale.

The Extent of the Compasses from S. 90 Degrees, to S. 22 Degrees 30 Minutes on the *Line of Sines*, will reach from 48.5 back to 18.6, on the *Line of Numbers*.

And,

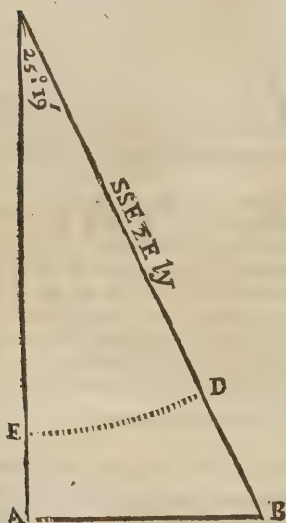
The Extent from S. 90 Degrees, 00 Minutes, to the S. 67 Degrees, 30 Minutes, on the *Line of Sines*, reaches from 48.5 backwards to 44.8, on the *Line of Numbers*.

C A S E II.

The Course and Difference of Latitude being given ;
to find the Departure and Distance sailed.

Admit a Ship sail from Latitude 48 Degrees 30 Minutes S. S. E. $\frac{1}{2}$ Easterly till she be in Latitude 47 Degrees 21 Minutes : I demand the Departure and Distance sailed.

Geometrically.



Draw the North and South Line C. A. and subtracting the Latitudes one from another, it leaves 69 Minutes for their Difference ; makes C A equal to 69, from the *Line of Equal Parts* ; from C. with 60 Degrees from the *Line of Chords*, describe D E, which make equal to 25 Degrees 19 Minutes ; draw C D, and raise the Perpendicular A B, which compleats the Triangle B A C, whose required Parts may be measured by the Scale.

By the Logarithms.

As Co-sine of the Course S. 64° 41' — 9.956148
Is to the Difference of Lat. 69 Miles — 1.838849
So is the Radius — — — — 10.000000
11.838849
To the Distance sailed B C 76.3 — 1.882701

Then,

As the Radius — — — — 10.000000
Is to the Distance sailed C B 76.3 — 1.882524
So is the Sine of the Course 25° 19' — 9.631058
To the Departure A B 32.6 — — 1.513582

By Gunter's Scale.

The Extent from S. 64 Deg. 41 Min. to S. 90 Deg. 00 Min. on the *Line of Sines*, will reach from 69 to 76.3 on the *Line of Numbers*.

And,

The Extent from S. 90 Deg. 00 Min. to S. 25 Deg. 19 Min. on the *Line of Sines*, will reach from 76.3 to 32.6 on the *Line of Numbers*.

C A S E III.

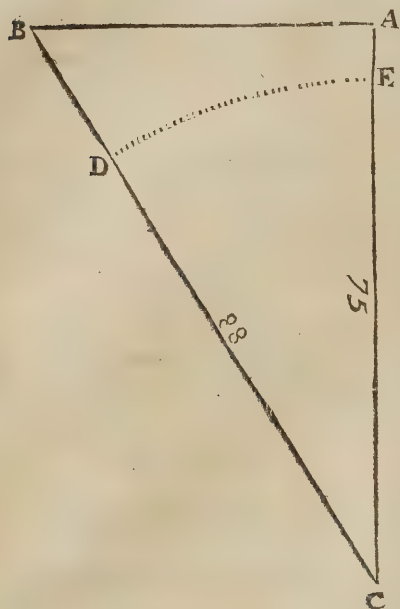
The Difference of Latitude and Distance sailed given ;
to find the Course and Departure.

Admit a Ship sail from Latitude 42 Degrees 15 Minutes North, on some Point between the North and West 88 Miles, and then finds herself in Latitude 43 Degrees 30 Minutes : I demand her Course and Departure.

From	—	—	—	43°	30'
Subtract	—	—	—	42	15
Remains	—	—	—	1	15
				60	
				<hr/>	
				75 = Diff. Lat.	

Geometrically.

Geometrically.



Draw the Meridian AC , which let be made equal to 75, raise the Perpendicular BA ; from C with 88 cross BA in B ; draw BC from C , with 60 from the *Chords* describe DE , which measured on the *Chords* or *Rhumbs*, shews the *Course*; $2\frac{1}{2}$ Points from the North-westward, viz. N. N. W. $\frac{1}{2}$ Westerly.

Note, That the Sides of Plain Triangles are measured by the Line of Equal Parts, but the Angles, by the Line of Chords.

By the Logarithms.

As the Distance run BC 88 — — — 1.94448

Is to the Radius — — — — — 10.00000

So is the Difference of Lat. CA 75 — — — 1.87506

To the Co-sine of the Course $58^{\circ}27'$ — — — 9.933058

Whose Complement 31 Degrees 33 Minutes is $2\frac{1}{2}$ Points from the Meridian, which is N. N. W. $\frac{1}{2}$ Westerly.

By Gunter's Scale.

The Extent from 88 to 75 on the *Line of Numbers*, reaches from S. 90 Degrees 00 Minutes, to 58 Degrees 27 Min. on the *Line of Sines*.

Then,

As the Radius — — — — — 10.00000

Is to the Distance run CB 88 — — — 1.94448

So is the Sine of the Course $31^{\circ}33'$ — — — 9.71870

To the Departure AB 46 Miles West — — — 1.66318

By Gunter's Scale.

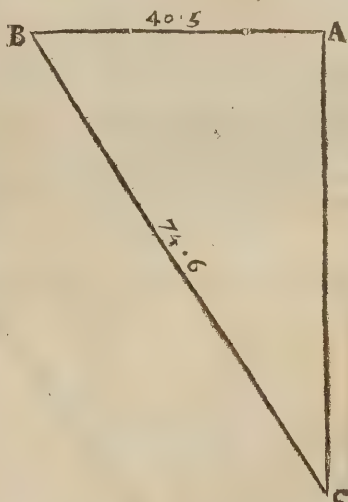
The Extent from S. 90 Degrees 00 Minutes to S. 31 Degrees 33 Minutes on the *Line of Sines*, will reach from 88 to 46 on the *Line of Numbers*.

CASE IV.

The Distance run, and Departure from the Meridian given; to find the Course and Difference of Latitude.

A Ship being in the Latitude of 59 Degrees 00 Minutes N. sails North Westward till her Distance run be 74.6 Miles, and the Departure 40.5: I demand the Course and Difference of Latitude, and consequently the Latitude the Ship is in.

Geometrically.



Draw the Meridian AC on A , (because the Ship sails Northward) raise the Perpendicular BA , laying thereon 40.5 Miles, the Departure from A to B ; then take 74.6 in your Compasses, from B cross the Meridian AC in C , and draw BC .

By Logarithms.

As the Distance run BC 74.6 Miles — — — 1.87273

Is to the Radius — — — — — 10.00000

So is the Departure BA 40.5 — — — 1.60745

To the Sine of the Course $32^{\circ}53'$ — — — 9.73472

By Gunter's Scale.

The Extent from 74.6 to 40.5 on the *Line of Numbers*, reaches from S. 90 Degrees 00 Minutes, to S. 32 Degrees 53 Minutes on the *Line of Sines*.

Then again:

As the Radius — — — — 10.00000
Is to the Distance B C 74.6 — — 1.87273
So is the Co-line of the Course 57° 7' — 9.92416

To the Difference of Latitude 62.6 — 1.79689

Which turned into Degrees, is 1 Degree 3 Minutes, and is to be added to 59 Degrees 00 Minutes, the Latitude she departed from, because she raises the Pole; the Sum 60 Degrees 3 Minutes the Latitude the Ship is in.

By Gunter's Scale.

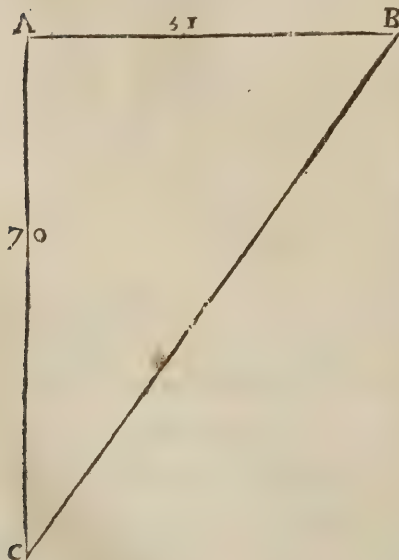
The Extent from S. 90 Degrees 00 Minutes, to S. 57 Degrees 7 Minutes, on the *Line of Sines*, will reach from 74.6 to 62.6 on the *Line of Numbers*.

CASE V.

The Difference of Latitude and Departure, from the Meridian given; to find the Course and Distance.

A Ship from Latitude 59 Degrees 00 Minutes North, fails North Eastward till she has altered her Latitude 1 Degree 10 Minutes or 70 Miles, and is departed from the Meridian 51 Miles: I demand the Course and Distance.

Geometrically.



Draw A C, which make equal to 70 Miles; raise the Perpendicular A B, which make also equal to 51 Miles, draw B C.

By the Logarithms.

As the Difference of Lat. A C 70 Miles 1.845098

Is to the Radius — — — — 10.000000

So is the Departure A B 51 Miles — 1.707570

To the Tangent of the Course 36° 5' 9.862472

By Gunter's Scale.

The Extent from 70 to 51 on the *Line of Numbers*, will reach from Tangent 45 Degrees 00 Minutes, to the Tangent 36 Degrees 5 Minutes on the *Line of Tangents*.

Then,

As the Sine of Course 36° 5' — — 9.77008

Is to the Departure 51 — — — 1.70757

So is the Radius — — — — 10.00000

To the Distance 86.5 Miles — — 1.93749

By Gunter's Scale.

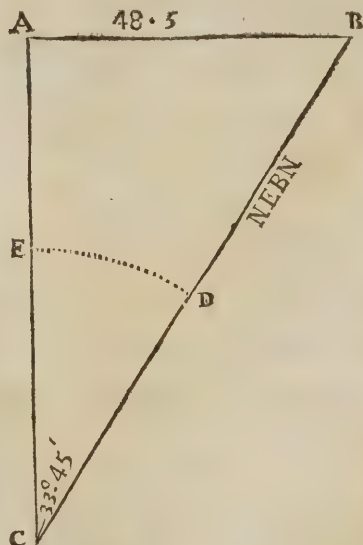
The Extent from S. 36 Degrees 5 Minutes, to the S. 90 Degrees 00 Minutes on the *Line of Sines*, will reach from 51 to 86.5 on the *Line of Numbers*.

CASE VI.

The Course and Departure given; to find the Distance and Difference of Latitude.

A Ship from the Latitude of 48 Degrees 30 Minutes N. fails N. E. by N. till her Departure from the Meridian be 48.5: What is the Distance sailed, and Difference of Latitude?

Geometrically.



Draw the Meridian A C, from C with 60 Degrees of the Chord describe D E, which make equal to 33 Degrees 45 Minutes, and let the Perpendicular A B be 48.5 from the *Equal Parts*.

By the Logarithms.

As the Sine of the Course $33^{\circ} 45'$ — 9.744739
 Is to the Departure A B 48.5 — 1.685741
 So is the Radius — — — 10.000000
 To the Distance C B 87.3 — 1.941002

By Gunter's Scale.

The Extent from S. 33° Degrees $45'$ Minutes, to S. 90° Degrees $00'$ Minutes on the Line of Sines, will reach from 48.5 to 87.3 on the Line of Numbers.

Then,

As the Radius — — — — — 10.000000
 Is to the Distance run 87.3 — — — 1.941001
 So is the Co-sine of the Course S. $36^{\circ} 15'$ 9.91984
 To the Difference of Latitude 72. — 1.86085

By Gunter's Scale.

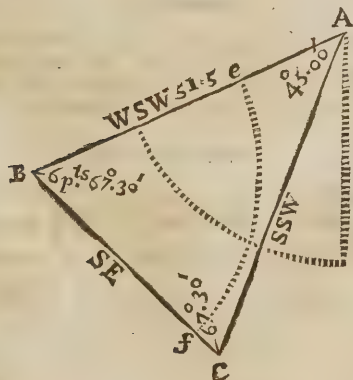
The Extent from S. 90° Degrees $00'$ Minutes, to S. 36° Degrees $15'$ Minutes, on the Line of Sines, reaches from 87.3 to 72.6 on the Line of Numbers.

These are the Seven usual Cases of Plain Sailing, which you see are all performed by the Knowledge of Rectangl'd Plain Trigonometry. The Doctrine of Oblique Plain Triangles, is not of such Necessary Use in Sailing, as that of Right-angled ones is: But however, I have here singled out some of the most Useful Cases of it, as follows.

Plain Sailing, where the Application of Oblique Triangles is required.

Example.

Coasting along the Shore, I set an Head-land C, bearing off me S. S. W. I sail W. S. W. 51.5 Miles to B, and then the Head-land C bears S. E. from me: I demand my several Distances to the Head-land.



Geometrically.

From A draw a S. S. W. Line, as A C, and a W. S. W. Line, as A B, and make A B = 51.5 Miles; then from B, with 60 Degrees of the Chords, describe $e f$, which make equal to fix Points, and draw B f.

By the Logarithms.

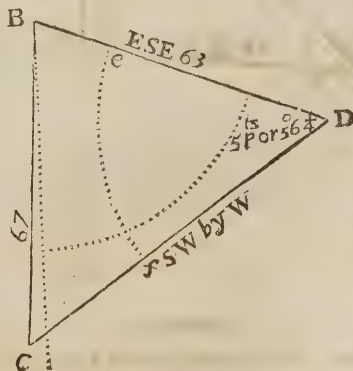
In the Triangle B A C, given B A 51.5 Miles and all the Angles, viz. The Angle A 45° Degrees, Angle B 67° Degrees $30'$ Minutes, and the Angle C 67° Degrees $30'$ Minutes; required B C and C A.

As the Sine of the Angle C $67^{\circ} 30'$ — 9.956153
 Is to the Distance A B 51.5 Miles — 1.7118072
 So is Sine of the Angle at A $45^{\circ} 00'$ 9.8494850
 To the Distance B C 39.4 — 1.5956769

And since the Angle B, is equal to the Angle C, the Side A C, will be equal to the Side A B.

Example II.

A Ship in the Parallel of 46° Degrees North as B, descries a Head-land at C, distant from her 67 Miles; she Sails E. S. E. 63 Miles to D, and then the Head-land at C bears S. W. by W. from her: How did the Head-land bear from the Ship when she was at B? And how far is it distant from her, now she's at D?



Geometrically.

From B draw an E. S. E. Line B D, which make equal to 63, and from D with 60 of the Chords describe $e f$, which make equal to $56^{\circ} 15'$, draw D f C: Then from B with 67 Miles, cross D C in C, and draw B C.

4 D 2

B₂

By the Logarithms.

As the Distance B C 67 Miles *Ar. co.* = 8.17392
 Is to the Sine of the Angle D $56^{\circ} 15'$ = 9.91984
 So is the Distance failed B D, 63 Miles = 1.79934

To the Sine of the Angle C $51^{\circ} 26'$ = 9.89310

Now $56^{\circ} 15' + 51^{\circ} 26' = 107^{\circ} 41'$, whose Complement to 180° , is $72^{\circ} 19' =$ Angle B, $6\frac{1}{2}$ Points, which added to E. S. E. gives the Bearing of C to be S. $\frac{1}{2}$ Westerly near.

Then,

As the Sine of the Angle D, $56^{\circ} 15' = 9.919846$

Is to the Distance B C 67 Miles = 1.826074

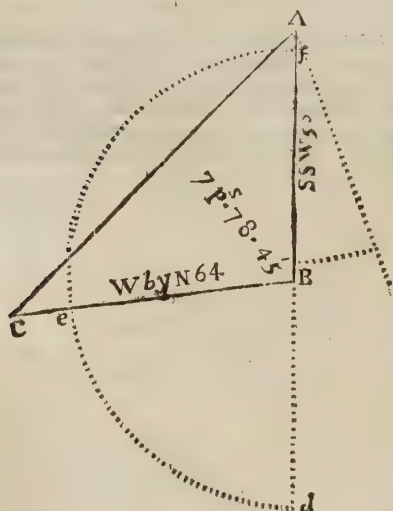
So is the Sine of the Angle B $72^{\circ} 19' = 9.978978$

11.805052

To the Distance D C $76^{\circ} 8' = 1.885206$

Example III.

If I fail S. S. W. 50 Miles, then W. by N. 64 Miles; I demand the Course and direct Distance from the Place of Departure?



Geometrically.

Draw A B = 50 M. a S. S. W. Line, and from B with 60 of the Chords described *def*; make *de* = 7 Points, or *fe* = 9 Points, draw B C through *e*, which make equal to 64 M.

By the Logarithms.

In the Triangle C B A, there's given the two Sides C B and B A, and the contained Angle C B A, 7 Points, to find the Angles A and C, and the third Side C A.

C B = 64
 A B = 50

Sum. = 114

Diff. = 14

As the Sum of the two Sides A B and B C 114 = 2.656904

Is to their Difference 14 = 1.146128

So is the T. of $\frac{1}{2}$ Sum of the \angle L C and A, $50^{\circ} 37' = 10.085698$

11.231826

To the T. of $\frac{1}{2}$ their Difference $80^{\circ} 30' = 9.174922$

Which subtracted from 50 Deg. 37 Min. there remains 42 Deg. $7' = \angle C$; but 8 Deg. 30 Min. added to 50 Deg. 37 Min. makes 59 Deg. 7 Min. = $\angle A$; and since A B is a S. S. W. Line, A C is W. by S. $\frac{1}{2}$ Westerly.

Then for the Distance A C, say,

As the Sine of the Angle A $59.7 = 9.983399$

Is to the Distance B C 64 M. = 1.806180

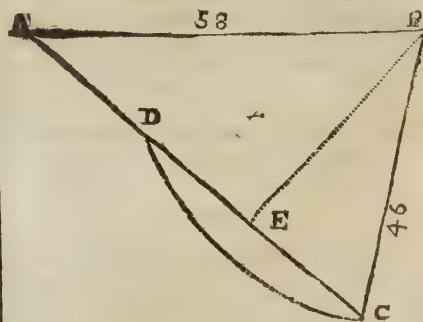
So is the Sine of the \angle B, or its Complement to 180° , $78^{\circ} 45' = 9.991573$

11.797753

To the Distance A C 73.2 M. = 1.864158

Example IV.

Admit two Ports lying in the same Parallel or Latitude, to differ in Longitude 58 Miles; and a Ship having failed from the Westermost, between the South and East 65 Miles, to be then 46 Miles from the Eastermost: I demand the Course she steered, and her Course to the Eastermost Port?



Geometrically.

Having drawn A B an East and West Line, and made it equal to 58 M. then from A with 65 M. describe an Arch, and with 46 M. from B cross that Arch in C, draw A C and B C.

By the Logarithms.

As A C 65 Miles = 8.187086

Is to the Sum of the Distance A B and B C 104 Miles = 2.017033

So is their Difference 12 Miles = 1.079181

To A D 19.2 = 1.283300

Which

Which added to A C 85, makes 84.2, whose half is 42.1 is A E.

Then,

As A B 58 Miles, Ar. Compl. — — 8.236571
Is to the Radius — — — — 10.000000
So is A E 42.1. — — — — 1.624282

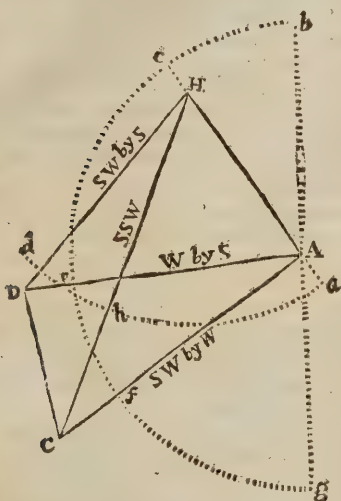
To the Co-sine of the Ang. A. $43^{\circ} 28'$ 9.860853

That is,

S. E. 1 Deg. 32 Min. Easterly, the Course she steered.

Example V.

Coasting along the Shore, I set two Head-lands, the one at C, bearing S. W. by W. the other at D, bearing W. by S. I sail away N. W. by N. to H. 40 Miles, and then the Head-land at C bears S. S. W. and that at D S. W. by S. I demand how far these Head-lands are asunder, and how they bear one from another.



Geometrically.

First draw $b A g$ a North and South Line, and with 60 of the Chords from A describe $b e g$; then make $g f = 5$ Points, $g e = 7$ Points, and $b c = 3$ Points; draw $A f C$, $A e D$, and $A H c$, make $A H = 40$ Miles.

Secondly, From H with 60 of the Chords describe $a d$, which make equal 6 Points; and also $a b$ equal 5 Points; draw $H b C$, $H d D$, and $D C$. Then is D one Head-land, and C the other.

By the Logarithms.

In the Triangle H A C given the Angle H A C $= 8$ Points, the Angle A H C 5 Points, and the Angle A C H $= 3$ Points, together with the Side H A 40 Miles to find the Side C H.

Therefore,

As the Sine of the Angle H C A } $33^{\circ} 45'$, Ar. Compl. — — — } 0.255261
Is to A H 40 Miles — — — — — } 1.602060
So is the Sine of $90^{\circ} = \angle H A C$ — — — } 10.000000

To the Side H C 72 Miles — — — 1.857321

Then in the Triangle D H A, there's given Angle H A D $= 6$ Points, the Angle A H D $= 6$ Points, and the Angle H D A $= 4$ Points, and the Side A H 40 Miles to find the Side D H. Thus :

As the Sine of the Angle H D A } $45^{\circ} 00'$, Ar. Compl. — — — } 0.150515
Is to the Side A H 40 Miles — — — } 1.602060
So is the Sine of the $\angle H A D 67^{\circ} 30'$ 9.965615

To D H 52.3 Miles — — — 1.718190

Then in Triangle D H C there's given two Sides, C H $= 72$ Miles, and D H 52.3; and their contained Angle C H D $= 1$ Point; to find the other two Angles H D C, H C D, and the third Side.

As the Sum of the Sides, H C } $+ H D 124.3$, Ar. Compl. — — } 7.905528
Is to their Difference 19.7 — — — } 1.294466
So is the Tangent of half the Sum } of $\angle H D C \& H C D 84^{\circ} 22'$ } 11.005954

To the Tangent of half their Dif- } ference $58^{\circ} 6'$ — — — } 10.209548

Now, 84 Deg. 22 Min. $+ 58$ Degr. 6 Min. $= 142$ Deg. 28 Min. Angle H D C.

But 84 Deg. 22 Min. $- 58$ Deg. 6 Min. $= 25$ Deg. 16 Min. Angle H C D $=$ N. one quarter Westerly.

Then,

As the Sine of the Angle H C D } $25^{\circ} 16'$, Ar. Compl. — — — } 0.369743
Is to D H 52.3 Miles. — — — — — } 1.718190
So is the Sine of the Angle D H C } $11^{\circ} 15'$ — — — — — } 9.290235

To D C 23.9 Miles the Distance } between the Head-lands — — — } 1.378168

PLAIN Scale, is a thin Ruler, either of Wood or Brass, whereon are graduated the Lines of Chords, Sines, Tangents, Secants, Leagues, Rumbs, &c. and is of ready Use in most part of the Mathematicks, chiefly in Navigation: A Description thereof see under the Word Scale.

PLAIN Table, is an Instrument used in Surveying of Land.

1. The Table it self is a Parallelogram of Wood, 14 Inches and a half long, and 11 Inches broad, or thereabouts.

2. A Frame of Wood fixed to it, so as a Sheet of Paper being laid on the Table, and the Frame being forced down upon it, squeezeth in all the Edges, and makes it lie firm and even, so as a Plot

Plot may be conveniently drawn upon it. Upon one Side of this *Frame* should be equal Divisions for drawing Parallel Lines both long-wise and cross-wise (as Occasion may require) over your Paper; and on the other Side the 360. Degrees of a Circle, projected from a Brass Centre conveniently placed in the *Table*.

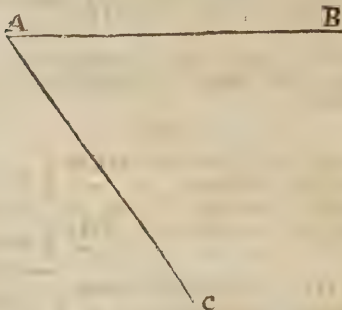
3. A *Box* with a *Needle* and *Card*, to be fixed with two *Screws* to the *Table*; very useful for placing the *Instrument* in the same Position upon every *Remove*.

4. A *Three-legged Staff* to support it, the Head being made so as to fill the *Socket* of the *Table*, yet so as the *Table* may be easily turned round upon it, when 'tis not fixed by the *Screw*.

5. An *Index*, which is a large *Ruler* of *Wood*, (or *Brass*), at the least 16 Inches long, and two Inches broad, and so thick as to make it strong and firm; having a sloped Edge, called the *Fiducial Edge*, and two *Sights* of one Height, (whereof the one hath a *Slit* above, and a *Thread* below, and the other a *Thread* above, and a *Slit* below,) so set in the *Ruler*, as to be perfectly of the same Distance from the *Fiducial Edge*. Upon this *Index* 'tis usual to have many *Scales* of equal Parts, as also *Diagonals*, and *Lines* of *Chords*.

To take Quantity of an Angle by the Plain Table.

As suppose *AB* and *AC* were two *Hedges* or *Fences* of a *Field*, and it were required to take the *Angle A*.



Plant your *Table* (fitted with the *Sheet* upon it) as nigh to the *Angle* as you can, the *North End* of the *Needle* hanging directly over the *Flower-de-Lis*; then make a *Mark* upon the *Sheet* of *Paper* at any convenient Place for the *Angle A*, and lay the *End* of the *Index* to the *Mark*, turning it about 'till through the *Sights* you espy *B*; then draw the *Line AB* by the *Edge* of the *Index*. Do the same for the *Line AC*, keeping the *Index* upon the first *Mark*: Then will you have upon your *Table* an *Angle* equal to the *Angle* in the *Field*.

When you have more *Angles* to take, the Method is the same.

The *Distances* from the *Angles* to the *Instrument* are measured by the *Chain*, and set off on the *Table* with a *Scale* and *Compasses*.

Whence 'tis so easie to take the *Plot* of a *Field* at one *Station*, by the *Plain Table*, that there needs no other *Direction*. See *Surveying*.

PLAINTIFF, is he that sues or complains in an *Affide*, or in an *Action Personal*; as in an *Action* of *Debt*, *Trespafs*, *Deceit*, *Detinue*, and the like.

PLANCERE, in *Architecture*, is the under part of the *Roof* of the *Corona*; which is the superior part of the *Cornice*, between two *Cymatiums*. See those *Words*.

PLANE of a *Dyal*, is the *Surface* on which any *Dyal* is supposed to be described. See a *General Account* of all such *Planes* under the *Word Dyalling*.

PLANE Horizontal, in *Perspective*, is a *Plane* which is parallel to the *Horizon*, and which passes thro' the *Eye*, or hath the *Eye* supposed to be placed in it.

PLANE of *Gravitation* or *Gravity*, in any heavy *Body*, is a *Plane* supposed to pass thro' the *Centre* of *Gravity* of it.

PLANE, in *Fortification*, is the *Representation* of a *Work* in its *Height* and *Breadth*.

PLANE of the *Horopter*, in *Opticks*, is that which passeth thro' the *Horopter*, and is perpendicular to the *Plane* of the two *Optical Axes*.

PLANE Number, is that which may be produced by the *Multiplication* of two *Numbers* one into another; thus, 6 is a *Plane Number*, because it may be produced by the *Multiplication* of 3 by 2; for twice 3 makes 6. So also 15 is a *Plane Number*, arising from 5 being multiplied by 3: And 9 is a *Plane Number*, produced by the *Multiplication* of 3 by 3.

PLANE Problem, in *Mathematicks*, is such an one as cannot be solved Geometrically, but by the *Interfection* either of a *Right Line* and a *Circle*; or of the *Circumferences* of two *Circles*: As, Having the greatest Side given, and the Sum of the other Two, of a *Right-angled Triangle*; to find the *Triangle*. To describe a *Trapezium* that shall make a *Given Area* of Four *Given Lines*. And such a *Problem* can have but two *Solutions*, because a *Right Line* can cut a *Circle*, or one *Circle* another but into *Points*. *Oxanam*.

PLANE Geometrical, in *Perspective*, is a *Plane Surface*, parallel to the *Horizon*, placed lower than the *Eye*; wherein the visible *Objects* are imagined without any *Alteration*, except that they are sometimes reduced from a greater to a lesser *Size*.

PLANE of *Reflection*, in *Catoptricks*, is that which passeth thro' the *Point* of *Reflection*, and is always perpendicular to the *Plane* of the *Glass*, or *Reflecting Body*.

PLANE of *Refraction*, is a *Surface* drawn thro' the *Incident* and *Refracted Ray*.

PLANE Surface, is that which lies even between its bounding *Lines*; and as a *Right Line* is the shortest *Extension* from one *Point* to another, so a *Plane Surface* is the shortest *Extension* from one *Line* to another.

PLANE Vertical, in *Opticks* and *Perspective*, is a *Plane Surface* which passeth along the *Principal Ray*, and consequently thro' the *Eye*, and is perpendicular to the *Geometrical Plane*.

PLANETS, are the *Erratick* or *Wandering Stars*, and which are not like the *Fixed ones* always in the same *Position* to one another. We now number the *Earth* among the *Primary Planets*.

Planets, because we know it moves round the Sun, as *Saturn*, *Jupiter*, *Mars*, *Venus*, and *Mercury* do, and that in a Path or Circle between *Mars* and *Venus*. And the Moon is accounted among the *Secondary Planets*, or *Satellites* of the *Primary*, since the moves round the Earth, as *Jupiter's* Four Moons or *Satellites* do round him, and *Saturn's* Five round about him; if *Cassini's* Eyes may be credited. But I could never see myself, or meet with any else, who ever did see any but the *Hugenian Satellite*.

All the Planets, as far as we can find, have, besides their Motion round the Sun, which makes their Year, also a Motion round their own Axes, which makes their Day; as the Earth's revolving so, makes our Day and Night.

It's more than probable that the Diameters of all the Planets are longer than their Axes: We know 'tis so in our Earth; and Mr. *Flamsteed* and Mr. *Cassini* both found it to be so in *Jupiter*. And therefore 'twas a great Mistake in the Ingenious Dr. *Burnet*, to assert, as he doth in his *Hypothesis*, the Polar Diameter of the Earth to exceed the other.

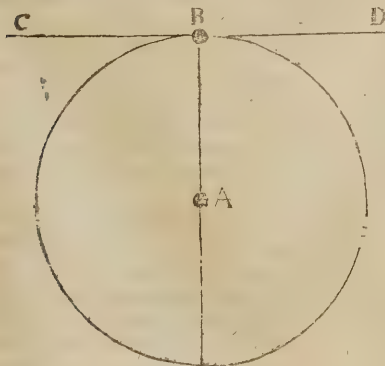
Sir *Isaac Newton* asserts our Earth's Equatorial Diameter to exceed the other by about 34 Miles: And indeed else the Motion of the Earth would make the Sea rise so high at the Equator, as to drown all the Parts thereabout.

The Learned Mr. Whiston, Professor of Mathematicks in the University of Cambridge, in his New Theory of the Earth, accounts (from the Admirable Sir II. Newton's Principles) for the Motion and Revolution of the Planets, thus:

LEMMA X.

From the uniform Projectile Motion of Bodies in Straight Lines, and the universal Power of Attraction or Gravitation, the Curvilinear Motion of all the Heavenly Bodies does arise.

If a Body, as B, be moving uniformly along the Line D C, from D to C, and another Body A be present; this latter Body A must draw the former B from its Straight Line D C: And by doing so continually, while at the same time the Body B retains its Projectile Force along a Straight Line in every Point of its Course, must make the Line of its real Motion become a Bent one, and change its Rectilinear into a Curvilinear Trajectory.



Hence may be learnt what is that *Conatus recedendi a centro motus* in revolving Bodies, and in what Sense 'tis to be understood. For since all Bodies have a *Vis centripeta* or Propension towards one another, 'tis impossible they should of themselves, in as proper a Manner, have a contrary Propension, or *Vis centrifuga*, an Endeavour of avoiding one another. The true meaning therefore of this Attempt or Endeavour to get farther off the Centre of Motion is only this, That all Bodies being purely passive, and so incapable of altering their uniform Motion along those Straight Lines or Tangents, to their Curves, in which they are every Moment, do still tend onwards in the same Lines, and retain their Propension or Effort towards that Rectilinear Motion all the Time they are obliged to move in Curves; and consequently at every Point of their Course, endeavour to fly off by their Tangents. Now the Parts of the Tangent, to which this Endeavour is, being farther from the Centre than those of the Curves to which the Bodies are actually forced, an Attempt to go on in the Tangent may be, and is stiled an Attempt to go farther off, or recede from that Centre; tho' from no other Affection than that of Inactivity, or of persevering in a Rectilinear Motion: So that tho' the *Vis centripeta*, or Power of Gravitation, be an Active and Positive Force, continually renew'd and impress'd on Bodies; yet the *Vis Centrifuga*, or *Conatus recedendi a centro motus*, is not so, but the meer Consequence and Result of their Inactivity.

This is evident in Bodies revolving in *Ellipses* about one of the *Foci*, in their Descent towards it; where the Tangent being oblique to the Radius, or Line from the Point of Contact to the *Focus*, this very *Conatus recedendi a centro motus* carrying it along the Tangent, will for some time make it approach nearer to the *Focus*; tho' not so much near as by its revolving in the *Ellipses* it self.

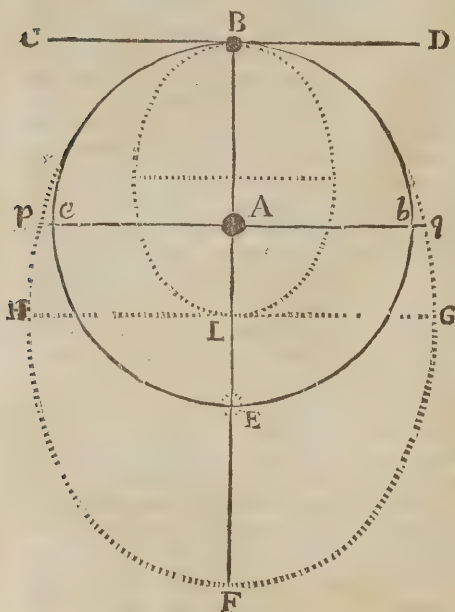
For let a Stone be let loose from the Sling, or any Revolving Body be disengaged from the Force which retained it in its Curve, and it will not go from the Centre, but only pass along the Tangent in which it was moving, as if there were no such Centre near it at all.

When the Projectile Motion of the Planets is in its Direction perpendicular to a Line from the Sun, and in its Degree of Velocity, so nicely adapted and contemper'd to the Quantity of the Sun's Attraction there, that neither can overcome the other, (the Force of Gravitation towards the Sun, and the Celerity of the Planets proper Motions, being perfectly in *equilibrio*;) the Orbits of such Revolving Planets will be compleat Circles; themselves neither approaching to, nor receding from the Sun, the Centre of their Motions. And the Case is the same in the Secondary Planets about their Primary ones.

Thus 'tis supposable, That the Velocity of all the Planets about the Sun, was exactly accommodated originally to his Power of Attraction; and that their Primitive Orbits were Perfect Circles; from which at this Day they do not much differ. Thus, however, *Jupiter's* Four *Satellites* or little Moons have their Motions so exactly proportioned to their Gravitation to him, that their Orbits, as far as the most nice Observations can judge, are perfect Circles, they keeping at an equal Distance from his Centre in all the Points of their Courses about him.

When

When the Projectile Motion is not adapted to, but is either too swift or too slow for the Attraction towards the Central Body, the Orbits described will be *Ellipses*; and in the former Case, when the Projectile Motion is too swift, the Orbit will be bigger than the Circle; and the nearer *Focus* of the *Ellipsis* will be coincident with the Central Body.



And in the latter Case, the Orbit will be less than the Circle, and the farther *Focus* of the *Ellipsis* will be Coincident with that Central Body. Thus, if the Celerity of B be exactly correspondent to the Attractive Force of the Central Body A, neither will prevail; and the Body preserving an equal Distance from the Centre, will describe the Circle B e B b.

If the Celerity be greater, it will overcome the Attraction, and cast it self farther off the Centre for some time, and so revolve about it in the larger *Ellipsis* B H F G; the Central Body possessing that *Focus* A which is nearest the Point B, where the Attraction began. But if the Celerity be smaller, the Attraction of the Central Body A will be too hard for it, will force it for some time to come nearer, and to describe the lesser *Ellipsis* B K L I; the Central Body possessing that *Focus* A which is farthest from the Point B, where the Attraction began: As will be very plain from the Consideration of the Figure relating hereto.

'Tis indeed possible that the Celerity of Bodies may be so great, compared with the Force of Attraction to the Central Body, as to cast them off with such Violence, that the Attraction will never be able to bring them round, or make them revolve about it: In which Case the Orbits described will be one of the other Conick Sections, either *Parabolas* or *Hyperbolas*, according to the less or greater Violence with which the Bodies are thrown; and the Central Body will possess

the *Focus* of such a Figure. But no *Phænomena* of Nature persuading us that *de facto* any of the Heavenly Bodies do describe either of those Lines, (tho' Comets *Ellipses* come near to *Parabolas*;) several Bodies moving about the same Central one, tho' their Primitive Velocity were equal, and Direction alike, yet if they be at different Distances from it, they will describe Figurers of different Species about it. For when that determinate Degree of Velocity, which at one Distance were just Commensurate to the Central Bodies Attraction, and so would produce a Circular Orbit, must at a farther Distance be too hard for it, by reason of the Diminution of the Attraction there; an *Elliptical* Orbit must be described, whose nearer *Focus* would be coincident with the Central Body. In like manner, when the same determinate Degree of Velocity were at a nearer Distance, where the Central Attraction is augmented, it would be too little for the same; and an *Elliptical* Orbit must be described, whose farthest *Focus* would be coincident with the Central Body. This cannot be difficult, if you consider that the Species of the Planetary Orbits depends solely on the Proportion between the Attraction towards the Central Body, and the Velocity of the Projectile Motion; as that Proportion remaining at any Distance whatsoever, the Bigness of the Orbits will be various, but the Species the same: So when that Proportion is changed, the Species of the Figures must be changed also; which being done, the Velocity given, by the various Force of Attraction in several Distances from the Centre, as well as by the various Velocities at a given Distance, of which before; 'tis evident the Species of the Orbits will be different in this as well as in the former Case.

And the greater Disproportion there is between the Quantity of Attraction and the Velocity of the Revolving Bodies, the farther from a Circular; and the more Oblong and Eccentric will the Orbits described be. And the greater Approach to Correspondence there is, the nearer to Circular, and the less Oblong and Eccentric will the same Orbits be.

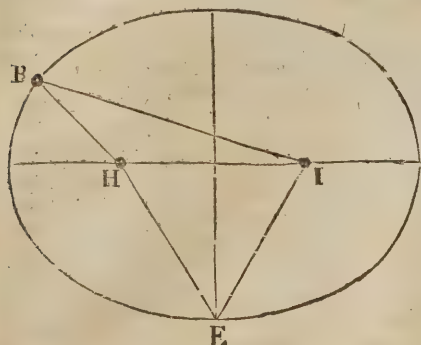
The Circular Orbits of Planets depend not only on the exact Adjustment of the Projectile Velocity to the Attractive Power of the Sun, but upon the Direction of the same Projectile Motion, at the Original Commencing of the Attraction.

Thus where the Planet is in its own Tangent, neither Ascending nor Descending, and the preceding Angle CBA is a Right one, which we have hitherto supposed; from the Correspondence of the Velocity to the Attraction, the Orbits will be perfect Circles. Otherwise, when the Direction of the Motion is Oblique, in any Measure ascending from or descending to the Central Body, and the preceding Angle CBA Obtuse or Acute; the Planet, tho' its Velocity were exactly adapted to the Attraction of the Central Body, would revolve in an *Ellipsis*; and the Point B, where the Attraction began, would be the End of the lesser Axis thereof.

If a Planet describe an *Ellipsis* about its Central Body in the *Focus* thereof, it will move fastest when 'tis nearest to, and slowest when 'tis farthest from the said Central Body or *Focus*, and agreeably in the intermediate Places. For seeing wheresoever the Revolving Body is, the Area is still proportionable to the Time, and so in equal Times

Times always equal; 'tis evident by how much the Distance is less, and the Line from the *Focus* is shorter, by so much must the Bodies Motion be swifter to compensate the same; and *vice versa*, by how much the former is longer, by so much must the latter be slower to allow for it.

If the Planet B describe an *Ellipsis* about the Central Body in the *Focus* H, as the *Area* described by the Line BH, will be exactly Uniform and Proportional to the Time of Description; so the Angular Motion, or Velocity of the Line from the other *Focus* B I, will be Proportional to the Time, and Uniform also, tho' not so Exactly and Geometrically.



The Law of Gravitation being supposed, if one Planet describe an *Ellipsis* about the Central Body in the *Focus* H, and another describe a Circle about the same in its Centre: If the Semi-diameter of the Circle be equal to H E, the middle Distance in the *Ellipsis* from the same Centre or *Focus*, their Periodical Times of Revolving will be the same; and when the Distances are equal, their Velocity will be so too.

Therefore, tho' the Planets revolve in *Ellipses* of several Species, yet their Periodical Times may be as well compared with one another, and with their Distances from the Central Bodies, as if they all revolved in Compleat Circles.

PLANIMETRY, the same with *Planometria*; which see.

PLANISPHERE, signifies the Circles of the Sphere described in *Plano*, or on a Plane; or it is a Plane or Flat Projection of the Sphere. And thus the Maps either of Heaven or Earth are called *Planispheres*; as also all other Astrolabical Instruments. And all Charts or Maps for the Use of Mariners, are called by Mr. Wright the *Nautical Planisphere*. See *Nautical*.

PLANOMETRIA, is the Mensuration of all Plane Surfaces or Figures.

PLANTARIS, is a Muscle of the *Tarsus*, so called from its Tendon expanded in the

PLANTA *Pedis*, like that of *Palmaris* in the Palm of the Hand. It arises Flethy from the Back-part of the outermost Tubercle of the lower Appendage of the Thigh-Bone, immediately under the External Beginning of the *Gastrocnemius Externus*; and descending obliquely between it and the *Gastrocnemius Internus*, soon becomes a thin flat Tendon; and which passing out from between their Flethy Bellies, descends internally la-

terally, by their great Tendon; and marching over the *Os Calcis*, expands it self on the Soal of the Foot, which it firmly adheres to, and to the Flethy Body of the *Musculus flexor digitorum perforatus*, and is inserted on both Sides the first Inter-node of each Lesser Toe. The Action of this Muscle is very obscure.

PLANTS.

The Learned and Experienced Botanist, Mr. John Ray, gives us the following Characteristick Notes of the chief Kinds of Plants; which make Twenty five Genders.

1. The Imperfect Plants, which do either totally want both Flower and Seed, or else seem to do so; there having yet no Seed or Flower been discovered to belong to them, or at least but to few of them; such as Corals, Sponges, *Alga Conserve*, Duck-meat, or the *Lens palustris*, the *Fungi*, *Tubera Terræ*, the Mosses, and some Liverworts.

2. Plants producing either no Flower at all, or an Imperfect one, and whose Seed is so small as not to be discernable by the naked Eye: Some of these bear their Seeds on the Back-part of their Leaves; as the Maiden-hairs, Spleen-worts, *Polypodium* and Ferns: Others bear it on the Stalk it self, adhering there by small single Foot-stalks; as the *Lichen Terrestris*, the *Licopodium*, or Wolfsc-law, the *Adiantum Aureum*, the *Lunaria*, *Equisetum*, &c.

3. Those whose Seeds are not so small as singly to be Invisible, but yet have an Imperfect or Stameneous Flower, i. e. such an one as is without the *Petala*, having only the *Stamina* and the *Perianthium*; as Hops, Hemp, *Mercurialis*, Nettles, Docks, Sorrels, Arsefmart, Knot-grals, Pondweed, Orach, Blite, Beet, Ladies Mantle, &c.

4. Such as have a Compound Flower, and emit a kind of White Juice or Milk, when their Stalks are cut, or their Branches broken off; such as Lettuce, Sow-thistle, Hawkweed, Dandelion, Succory, Goats-beard, Nipplewort, &c.

5. Such as have a Compound Flower of a Discous Figure, the Seed *Pappus*, or winged with Down, but emit no Milk as the former do; as Colts-foot, Fleabane, Golden Rod, Ragweed, Groundsel, Cudweed, &c.

6. The *Herba Capitata*, or such whose Flower is composed of many small long Fistulose or hollow Flowers gathered together in a round Burron, Ball, or Head, which is usually covered with a Squammose or Scaly Coat, of which Kind are the Thistle, the greater Burdock, Blue-Bottle, Knapweed, Saw-worth, &c.

These have all a Down adhering to their Seeds.

7. The *Corymbiferous* Plants, which have a compound Discous Flower, but their Seeds have no Down adhering to them: The Reason of the Name

Name you have under the Word *Corymbus*; of this kind, is Corn Marigold, Common Ox-Eye, Yarrow, the Daise, Camomile, Tanfie, Mugwort, Scabious, Teasel, Eryngo's, &c.

8. Plants with a perfect Flower, and having only one single Seed belonging to each single Flower; such are Valerian, Corn-faller, Agrimony, Burnet, Meadow Rue, Fumitory, &c.

9. The *Umbelliferous Plants*, which have a *Pentapetalous Flower*, (*i. e.* one having just 5 small *Petala* or *Leaves*.) and belonging to each single Flower there are two Seeds lying naked and joined together. They are called *Umbelliferous*, because the Plant, with its Branches and Flowers, hath an Head like a Ladies *Umbrella*, which they call *Umbella*.

This is a very large Genus of Plants, which therefore he thus subdivides into,

1. Such as have a broad flat Seed, almost of the Figure of a Leaf, or which are encompassed round about with something like *Leaves*; as Cow-Parfnep, Wild and Garden Parfnep, Hogs Fennel, (*Pucedanum*.) &c.
2. Such as have a longish Seed swelling out in the middle, and larger than the former; as Shepherds Needle, Cow-weed, Wild Chervil, Common Speignel or Meu, &c.
3. Such as have a shorter Seed; as *Angelica* and *Alexanders*.
4. Such as have a Tuberous Root, as the Earth Nut, Kipper Nut, or Pig Nut, Water Dropwort, and Hemlock Dropwort.
5. Such as have a small wrinkled channelled, or striated Seed; as Stone Parsley, Water Parsnep, Burnet, Saxifrage, Caraways, Smallage, Hemlock, Meadow Saxifrage, Sampire, Fennel, Rock Parsley, &c.
6. Such as have rough, hairy, or bristly Seed; as Mountain Stone Parsley, Wild Carrot, or Birdsnest, Hedge and Bastard Parsley, Hemlock, Chervil, Sea Parsnep.
7. Such as have their Leaves entire and undivided into Jags, &c. as *Perfoliata*, or Thorow-wax, Sanicle, the least Hares Ear, &c.
10. The *Stellate Plants*, which are so called, because their Leaves grow on their Stalks, at certain Intervals or Distances, in the form of a Radiant Star. Their Flowers are really *Monopetalous*, but divided into four Segments, which look like so many distinct *Petala*, or four Leaves; and each Flower is succeeded by two Seeds which grow at the bottom of it.

Of this Kind is Crows-wort, or Mugweed, with Madder, Ladies Bedstraw, Woodruff, Cleavers, &c.

11. The *Asperifoliae*, or Rough-leav'd Plants: They have their Leaves placed alternately, or in no certain Order on their Stalks; they have a Monopetalous Flower cut or divided into five

Partitions; and after every Flower there succeeds usually four Seeds; such as Cynoglossa, or Hounds Tongue, Wild Bugloss, Vipers Bugloss, Comfrey, Moule Ear, Scorpion Grass, &c.

12. The *Suffrutices* or *Verticillate Plants*: Mr. Ray, in his last Edition of his *Synopsis Methodica Stirp. Britann.* saith, The more certain Marks or Characteristick Notes of this kind of Plants are, That their Leaves grow by Pairs on their Stalks, one Leaf right against another, their Flower is Monopetalous, and usually in the form of an Helmet or Hood, there succeed four Seeds usually to each Flower, and which have no other Seed Vessel but the *Perianthium*: For that Mark of their Flowers growing in Whirls about the Stalk, as they do in the Dead Nettle, Hore Hound, &c. is not found in all Plants of this Genus. To this Head belong Mother of Thyme, Mint, Penny-Royal, Vervain, Wood Betony, Selfheal, Alehoof, Bugle, *Scordium*, Motherwort, &c.

13. Such as have many naked Seeds (at least more than four) succeeding their Flower, which therefore they call *Polyperme Plantae Semine nudo*. By naked Seeds, they mean such as are not included in any Seed Pod, or Cafe, out of which they spontaneously drop; but such as either have nothing at all covering their Seeds, or else drop off with their Covering upon them. Of this Kind are Pilewort, Crowfoot, Marsh-Mallows, Avens, Strawberries, Cinquefoil, Tormentil, Meadow-sweet, &c.

14. *Bacciferous Plants*, or such as bear Berries; as Briony, Dwarf, Honyfuckle, Butchers-broom, Solomon's Seal, Lilly of the Valley, Nightshade, Asparagus, Whorts or Whortle-berries, &c.

15. *Multisiliquous*, or *Corniculate Plants*; or such as have after each Flower many distinct, long, slender, and many times crooked Cafes, or *Siliqua*, in which their Seed is contained; and which, when they are ripe, open of themselves, and let the Seeds drop out: Of this Kind is the Common Houfleeke, Orpine, Navelwort, or Walpennywort, Bearsfoot, Marsh Marigold, Columbines, &c.

16. Such as have a Monopetalous Flower, either Uniform or Difform, and after each Flower a peculiar Vessel, or Seed Cafe, (besides the common Calix) containing the Seed, and this often divided or parted into many distinct Cells. These by some are called *Vasculiferous Plants*, such as common Henbane, Marsh Gentian, Bindweed, Throatwort, Rampions, Toad Flax, Fox Glove, Yellow and Red Rattle, or Cock's-comb, Eyebright.

17. Such as have an uniform Tetrapetalous Flower, but bear their Seeds in Oblong Siliquous Cafes; as your Stock-gilliflower, Wall-flower, common Whitloe Grass, Jack by the Hedge, or Sauce alone, common Mustard, Charlock or Wild Mustard, Radish, Wild Rocket, Ladies Smock, Scurvy-grass, Woad, &c.

18. *Vasculiferous Plants*, with a seemingly Tetrapetalous Flower, but of an Anomalous or Uncertain Kind: For this Flower, tho' it be deeply divided

divided in four Segments, is yet really Monoepalous, and falls off all together in one; such as Speedwell or Fluellin, Wild Poppy, Yellow Poppy, Loose Strife, Spurge, and Plantain, (according to Mr. Ray.)

19. *Leguminous Plants*, (or such as beat Pulse,) with a *Papilionaceous Flower*. Their Flower is Difform, and almost in the Form of a Butterfly and Wings expanded, (whence the Name *Papilionaceous*,) consisting of four parts, joined together at the Edges; these are Pease, Vetches, Tares, Lentils, Beans, Liquorice, Birdsfoot, Trefoil, Restharrow, &c.

20. *Vasculiferous Plants*, with a *Pentapetalous Flower*. These, as the 16th and 18th Kind, have besides the common Calyx or Cup of the Flower, a peculiar Case containing the Seed, and their Flower consisting of 5 Leaves; such as Maiden Pinks, Campions, St. John's-Wort, Male Pimpernel, Chickweed, Cranebill, Flax, Primrose, Periwinkle, Centory, Wood Sorrel, Marsh Trefoil, &c.

21. *Plants with a true Bulbous Root*. A Bulbous Root consists of but one round Ball or Head, out of whose lower Part or Basis there go many Fibres or Strings to keep it firm in the Earth. The Plants of this Kind, when the first appear, come up with but one Leaf, and the Leaves are nearly approaching to those of the Grass Kind of Plants, for they have no Foot-stalk, and are long and slender: The Seed Vessels are divided into three Partitions; their Flower is usually *Hexapetalous*, or seemingly divided into six Leaves or Segments; such as Garlick, Daffodil, Hyacinth, Saffron, &c.

22. Such as have their Roots approaching to a Bulbous Form. These emit at first coming up but one Leaf, and in Leaves, Flowers, and Roots, resemble the true Bulbous Plants; such as *Flower de Lis*, Cuckoo-pint, Orchis, Broom-Rape, Bastard Hellebore, Tway-blade, Winter-green, &c.

23. *Culmiferous Plants*, with a Grassy Leaf, and an Imperfect Flower. Culmiferous Plants are such as have a smooth hollow jointed Stalk, with one long sharp-pointed Leaf at each Joint, encompassing the Stalk, and set on without any Foot-stalk: Their Seed is contained within a Chaffy Husk; such as Wheat, Barley, Rye, Oats, and most Kinds of Grasses.

24. Plants with a Grassy Leaf, but not Culmiferous, with an Imperfect or Staminous Flower; as Cypress Grasses and Rushes, Cats Tail, Burr Reed, &c.

25. Plants whose Place of Growth is uncertain and various, but chiefly Water Plants, as the Water Lilly, Water Millfoil, Water-wort, Pepper-grass, Mouse-tail, Milkwort, Dodder, &c.

There is also another usual Division of Plants into *Trees, Frutices or Shrubs, Suffrutices and Herbs*; but this is rather Popular and Vulgar, than Just and Philosophical.

PLASM, the same with a Mould in which

any Metal, or such like running Matter, which will afterwards harden, is cast.

PLAT-Bastion. See Bastion.

PLAT-Band, in Architecture, is a Square-Mould which terminates the Architecture of the Dorick Order, or the Fascia which passeth immediately under the Triglyphs, and serves for the same Use in this Order, as the Cymarium in the others. It is also the Fascia of the Chambranes; And the same Name is also attributed to divers other Members of Architecture, which are destitute of Ornament, having only a certain Breadth without much Projection.

PLATES, a Term in Heraldry. See Balls.

PLATFORM, in Fortification, is a Place prepared on the Ramparts for the raising of a Battery of Cannon; or it is the whole Piece of Fortification raised in a re-entring Angle. See Battery.

PLATFORM, in Architecture, is a Row of Beams that support the Timber-Work of a Roof, and lie on the top of the Wall, where the Entablature ought to be raised. Also a kind of Terrass Walk, or even Floor on the Top of a Building; from whence we may take a fair Prospect of the adjacent Gardens or Fields. So an Edifice is said to be covered with a Platform, when it hath no Arched Roof.

PLATFORM, or Orlop, in a Man of War, is a Place on the Lower Deck of her, abaft the Main Mast, and round about the Main Capstan, where, in the Time of Service, Provision is to take care of the Wounded Men; 'tis between the Main Mast and the Cock-pit.

PLATISMA, is a broad Linen-cloth put upon Sores.

PLATONICK Bodies. See Regular Bodies.

PLATOON, corruptly from the French Word *Peloton*, is a small Square Body of Musketeers; such as is usually drawn out of a Battalion of Foot, when they form the Hollow Square to strengthen the Angles; and the Granadeers are generally thus posted.

PLATTS in a Ship, are flat Ropes made of Rope-yarn, and weaved one over another; their Use is to save the Cable from Galling in the Haule, or to wind about the Flukes of the Anchors to save the Pendant of the Fore-sheer from galling against them.

PLAYNT, in Law, is the propounding, or exhibiting of any Action Real or Personal in Writing; and the Party making this Playnt, is called *The Party Plaintiff*.

PLEA, in Law, signifies that which either Party alledgeth for himself in Court, and are either *Pleas of the Crown*, or *Common-Pleas*. *Pleas of the Crown*, are all of them Suits in the King's Name, against Offences committed against his Crown and Dignity, or against his Crown and Peace; and those seem to be Treasons, Felonies, Misdemeanors of either; and *Mathem*. *Common Pleas* be those that are held between Common Persons, yet by the former Definitions, they must comprise all other, tho' the King be a Party. *Plea* may farther be divided into as many Branches as *Action*; which see, for they signify all one.

Then there is a *Foreign Plea*, whereby Matter is alledged in any Court, that may be tried by another.

PLEADINGS, in Law, are all the Sayings of the Parties to Suits after the Count or Declaration;

to wit; whatever is contained in the Bar, Replication, and Rejoinder, and not in the Count itself; and therefore Defaults in the Matter of the Count, are not comprised within *Mispleading*, or insufficient *Pleading*, but only *Mispleading*, or insufficient *Pleading*, committed in the Bar, Replication, or Rejoinder.

PLEDGES, in Common Law, are Sureties, either real or formal, which the Plaintiff finds to prosecute his Suit.

PLEGIIS *acquietandis*, is a Writ that lies for a Surety, against him for whom he is Surety, if he pay not the Money at the Day.

PLEIADES, the same with those seven Stars in the Neck of the Bull, which are usually thus called,

PLENA *foris factura*, & *plena vita*. See *Forfeiture*.

PLENARTY, in Law, is when a Benefice is full directly contrary to *Vacation*, which signifies the being void of a Benefice.

PLENITUDE, is when a Man has too much Blood; the same with *Plethora*.

PLEONSAMUS, is a Figure in Discourse, when a Word not necessary is added, to express a Vehemency in us, and a greater Certainty in the Thing; as when we say, *I saw it with these Eyes*: Here, *saw it*, is really enough in Grammar, but *with these Eyes*, is added, to shew both the Certainty of the Fact, and our Zeal and Vehemence in asserting it.

PLEROTICA are Medicines that breed Flesh, and fill up Wounds.

PLETHORA, when there's more good Blood than is requisite: It happens either to the Vessels, when they are stretch'd out, and cannot hold all; or to the Strength, for sometimes, tho' the Vessels be not over full, the Strength is over-loaded.

PLEVIN, in Common Law, signifies a War-rant, or Assurance. See *Replevin*.

PLEURA, is the Skin or Membrane which covers the Inside of the Thorax, adhering to the Ribs.

PLEURITIS, a *Pleurisie*, is an Inflammation of the Membrane *Pleura*, and the Intercoastal Muscles, attended with a continual Fever, and Stitches in the Side, Difficulty of Breathing, and sometimes Spitting of Blood; and it's either a true *Pleurisie*, as this which we have described, or a Bastard *Pleurisie*, whose Symptoms are not so violent, and in some Things different from the former.

PLEXUS *choroides* seems to hang over the Pineal Glandule, as it were over a Button. It is an admirable Texture of small Arteries in the Brain like a Net.

PLEXUS *Nervosus*, is when two or three Nerves meet together, and jut out.

PLEXUS *reticularis*. Vid. *Choroides*.

PLICA, is an Epidemical Disease in Poland, when their Hairs grow together like a Cow's Tail; besides, they are Crooked-back'd, have loose Joints, it wrenches their Limbs, and loosens them, breeds Lice, with other Symptoms.

PLINTHUS, or *Plinthis*, in Architecture, is taken for that Square Member which serves as a Foundation to the Base of a Pillar: But *Vitruvius* calls the upper part, or *Abacus* of the *Tuscan* Pillar, a *Plinth*, because it resembles a square Tile.

Moreover, the same Denomination is sometimes attributed to a thick Wall, wherein there are two or three Rows of Bricks advanced in form of a *Plat-band*. This

PLINTH, *Palladio* calls the *Orle*, and *Blondell* the *Abacus*. The Word is also used for a like Member about the Capital of a Pillar; but then 'tis called always the *Plinth* of the *Capital*, and is placed just above the *Echinus* in the *Doric*, and above the *Ovolo*, or quarter Round, in the other Orders.

PLOW, is an Instrument made of Box or Pear-tree, used by Seamen to take the Height of the Sun or Stars, in order to find the Latitude: It admits of the Degrees to be very large, and is much esteemed by many Artists.

PLUMB-Line, the same with *Perpendicular*.

BLUMBUM *ustum*, is a Composition of two Parts of Lead melted in a Pot or Crucible, with one Part of Sulphur then added to it, and kept o'er the Fire till they be burnt all out; the Matter will then be turned into a Black Powder, which they properly call by this Name *Plumbum Ustum*.

PLUME, is the Term used by Botanists for that Part of the Seed of a Plant, which in its Growth becomes the Trunk; 'tis inclosed in two small Cavities formed in the Lobes for its Reception; and is not like the *Radicle*, an entire Body, but divided at its loose End into divers Pieces, all closely bound together like a Bunch of Feathers; whence *Dr. Grew* very properly gives it the Name of *Plume*. In Corn it is that Part, which, after the *Radicle* is shot forth, shoots out towards the smaller End of the Seed, and therefore is by some called the *Acrospire*.

PLURIES, is a Writ that goeth out in the third Place, after two former Writs that had no Effect: For first the Original *Capias* issues, and if that speed not, then goeth out the *Alias*, and if that also fails, then the *Pluries*.

PNEUMATICK Engine, the same with the *Air Pump*.

PNEUMATOCELE, is a Windy Rupture, when the Skin of the *Scrotum* is distended with Wind.

PNEUMATODES, is a short Breathing.

PNEUMATONIPHALUS, is a Swelling in the Navel, got by Wind.

PNEUMATOSIS, is the Generation of Animal Spirits, which is performed in the Cortical Substance of the Brain; the little Arteries there are emptied, and the Spirits distil, which after they are come as far as the Middle of the Brain, they Actuate and Invigorate all the Nerves.

PODAGRA. vid. *Arthritis*, The Gout in the Feet.

POETICAL, *Rising and Setting of the Stars*: This is peculiar to the Ancient Poetical Writers, for they refer the Rising and Setting of the Stars, always to that of the Sun; and accordingly make three Sorts of Poetical Rising and Setting. *Cosmical*, *Acronical*, (or as some write it, *Acronyctal*), and *Heliacal*. See those Words.

POINT, a Point in Geometry, is that which is supposed to have no manner of Dimensions, but to be Indivisible in every respect.

The Ends or Extremities of Lines are Points.

If a Point be supposed to be moved any way, it will by it Motion describe a Line.

POINT Blank, a Term in Gunnery, signifying that a Shot or Bullet goes directly forward to the Mark, and doth not move in a Curve as Bombs and highly elevated Random Shots do.

POINT

POINT, in Navigation, signifies 11 Degrees 15 Minutes, or one 32d Part of the Compass: The half of which is 5 Degrees 38 Minutes; which they call a *Half Point*; and the half of this, which is 2 Degrees 49 Minutes, they call a *Quarter Point*.

The Seamen also call the Extremity of any Promontory (which is a Piece of Land running out into the Sea) a *Point*; which is of much the same Sense with them as the Word *Cape*.

They say two Points of Land are one in another, when they are so in a Right Line one against another, as that the Innermost is hindered from being seen by the Outermost.

POINT of *Concourse*, in Opticks, is that Point where the *Visual Rays*, being reciprocally inclined, and sufficiently prolong'd, meet together, are united in the middle, and cross the Axis. This Point is most usually called the *Focus*; and sometimes the *Point of Convergence*.

POINT of *Concurrence*, a Term in Perspective. See *Principal Point*.

POINT of *Divergence*. See *Virtual Focus*.

POINT of *Incidence*, in Opticks, is that Point on the Surface of a Glass, or other Body on which any Ray of Light falls: And as some also word themselves, That Point of the Glass, which a Ray parts from, after its Refraction, and when 'tis returning into the *Rare Medium* again.

POINT of *Inflexion* of a Curve. See *Inflexion*.

POINT *Principal*, a Term in Perspective. See *Principal Point*.

POINT *Sensible*, according to Mr. Lock, is the least Particle of Matter or Space which we can discern; and to the sharpest Eyes, is seldom less than thirty Seconds of a Circle, whereof the Eye is the Centre.

POINTING the *Cable*, is when the Strands about two Foot from the End are untwisted, in order to make Sinner of the Rope-yarn, and then to lay them one over the other again, making it less towards the End, where all is made fast together with a Piece of Marlin, the Design of which is partly to keep the Cable from raveling out, but chiefly that none of the Cable may be cut off, and stole away.

POINT *In*, when two Piles are born in a Coat of Arms, so as to have their Points meet together in any part of the Escutcheon. They say, *He bedareth two Piles in Point*.

POINTS in *Heraldry*, are several Places in an Escutcheon, diversly named according to their Situation. See the Word *Escutcheon*.

POINT *Campion*,
POINT *Dexter*,
POINT *Plain*,
POINT *in Point*, } All Abatements of Honour; which see under that Word.

POINTS of *Station*, in Astronomy, are those Degrees of the Zodiack, in which a Planet seems to stand quite still, and not to move at all.

POLAR *Circles*, are two Circles supposed to be drawn parallel to the *Equinoctial* or *Equator*, thro' 23 Degrees 30 Minutes Distance from the *Polar Points*; and that about the *North-Pole* is called the *Arctic Circle*, and the other about the *South-Pole*, the *Antarctic Circle*, because opposite to the former.

POLAR *Dials*, are those whose Plane are parallel to some Great Circle that passes thro' the

Poles, or parallel to some one of the Hours; so that the *Pole* is neither elevated above, nor depressed below the Plane, therefore the Dial can have no Centre, and consequently its *Stile*, *Substile*, and *Hour Lines*, are parallel. This therefore will be an Horizontal Dial to those who live under the *Equator* or *Line*.

In a *Direct Polar Dial*, the Hour Lines must be drawn all parallel to the Hour Line of Twelve.

The *Stile* may be either a strait Pin set upright, or a Wyer made to lie parallel to the Plane, and must stand over the Hour-Line of Twelve.

The Length of the Plane may be taken in any Inches, or Parts of Inches, reckoning the Inch to be divided into 10, or 100 Equal Parts.

Then for the *Height of the Stile*, say,

As the Tangent of the Hour-Line 4 or 5, is to the Logarithm of their Distance from the Meridian in Inches and Parts.

So is the Radius, to the *Height of the Stile* in Inches and Parts.

For the *Hour-Lines*; say,

As the Radius is to the Logarithm of the *Stiles Height*, in Parts of Inches.

So is the Tangent of any Hour-Line, to the Logarithm of the Distance thereof from the Meridian Line.

Example.

Suppose your *Polar Plane* be 12 Inches long, and it be required to put on all the Hour-Lines from 7 in the Morning unto 5 in the Afternoon.

Here you have 5 Hours and 6 Inches on either Side of the Meridian; and before you work the Operation, the Hours and Inches must be reduced into Degrees or Parts, allowing for every Hour or Inch 15 Degrees, or 100 Parts, so you'll have 75 Degrees, and 600 Parts.

Then for the *Stiles Height*.

To the *Ar. Co.* of the Tangent 75° } 9.428053
(= 5 Hours.) — — — —

Add the Logarithm of the Distance } 2.778151
from the Meridian 600 Poles — — — —

Sum = the Logarithm of the *Stiles Height*, 161 Parts. — — — } 2.206204

That is, 1 Inch, and 61 Parts of an Inch.

For the *Hours Distance from the Meridian*.

To the Log of the *Stiles Heig.* 161 Pts. 2.206204
Add the Tang. 15° (for the 1st Hour) 9.428052

Sum = Radius = Logarithm of } 1.634256
the Hours Distance = 43 Parts — — — —

After the same manner may you find the other *Hours Distance from the Meridian*.

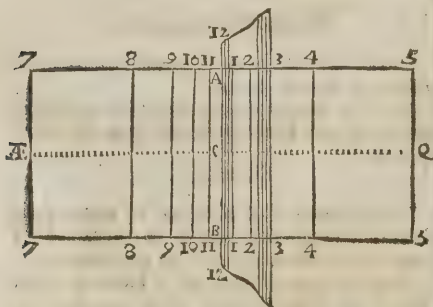
Then

Then draw them in a Table thus :

Hours.	Angles at the Poles.	Tangent.
H. H.	G. M.	Inch. Parts.
12	00 00	00 00
11	15 00	00 43
10	30 00	00 63
9	45 00	01 61
8	60 00	02 79
7	75 00	06 00
6	90 00	Infinit.

To project the Dial.

First Draw on the Plane the Meridian Line A B which crofs at Right Angles with $\mathcal{E} Q$, the Equator. Then from c , the Intersection of the Meridian and the Equator, set off those Parts from the Table both ways, and thro' these Points draw Lines parallel to A B, (or the Hour-Line of 12,) those shall be the Hour-Line I required.



POLAR Projection, is a Representation of the Earth, or of the Heavens, projected on the Plane of one of the Polar Circles.

POLARITY, is the Property of the Magnet, or of a Piece of Oblong Iron touch'd by a Magnet, to point toward the Poles of the World.

POLE, in Measuring, is the same with Perch or Rod, or as some call it, Lugg. By our Statute Law, (*Ann. 35 Eliz. Cap. 6.*) this Measure is, a Length of 16 Feet and an half, but it varies by the Usage of some Countries, being in some Places of 18 Feet, which they call *Woodland Measure*; in some Places of 21 Feet, which is called *Church Measure*, (*i. e.* of such Lands as did or do belong to the Church;), and in others of 24 Feet, and this is called *Forest Measure*.

POLE, in Mathematicks, is a Point 90 Degrees distant from the Plane of any Circle, and in a Line perpendicularly erected in its Centre; which Line is called the Axis. And from this Polar Point may Circles be described on the Globe or Sphere, as they are on the Plane from their Centre.

POLE Star, is a Star in the Tail of the Little Bear, (a Constellation of 7 Stars, which is called *Cynosura*), and is very near the exact North Pole of the World. The right Ascension of this Pole Star for this Year, 1700, is 0 Hours 35 Minutes 0 Seconds of Time; and it increases 1 Minute

16 Seconds every 10 Years: Therefore having at any time this Star's Right Ascension, and the Right Ascension of the Sun, (both in time,) if you Subtract the latter from the former, (adding 24 Hours to the Right Ascension of the Pole Star when it is less than the Sun's,) the Remainder will be the Time when the Pole Star is in the Meridian. Then hang up two Strings and Plummetts between the Pole Star and your Eye, and you will have a true Meridian Line, which will be of great Use to rectifie a Clock or Watch. And you may find the Meridian very nicely, if instead of the Strings above mentioned, you use the Sights of a good Circumferenter, or other Surveying Instrument.

Some Persons have been might apt to imagine, That the Height or Elevation of the Pole, and also the Position of the Circles of the Heavens, in respect of those on the Earth, hath much changed and varied: But Mr. *Cassini* is doubtless right in his Assertion, That there is no just Ground for any such Surmise: And that all the Difference which we find now in the Latitudes of Places, &c. in respect of the Ancient Accounts, arises from the former Observations not being well made; as indeed we may judge they cannot have been, since they had no such good Instruments to do it withal, as the Modern Astronomers have.

Yet he thinks it very probable, that there may be some little Variation in the Height of the Pole, in one and the same Place; but this not exceeding two Minutes, and which will in Process of Time quite vanish, after 'tis arrived to its highest Difference. Vid. *Memoires de Mathemat. & de Physique*, July, 1693.

POLE of a Glass (in Opticks) is the thickest part of a Convex, but the thinnest of a Concave Glass, and if the Glass be truly ground, will be exactly in the middle of its Surface: This is sometimes called, The Vertex of the Glass.

POLES of the World, are two Points in the Axis of the Equator, each 90 Degrees distant from its Plane; one pointing North, which therefore is called, The North or Arctic Pole; the other Southward, which therefore is called, The South or Antarctic Pole.

Whether any People live directly under the Pole or not, is a Question; but Mr. *Halley* hath proved, That the Solstitial Day, under the Pole, is as hot as under the Equinoctial, when the Sun is Vertical to them, or in their Zenith; because for all the 24 Hours of that Day under the Pole, the Sun's Beams are inclined to the Horizon with an Angle of $23\frac{1}{2}$ Degrees: Whereas under the Equinoctial, tho' he become Vertical, yet he shines no more than 12 Hours, and is absent 12 Hours: And besides, for 3 Hours 8 Minutes of that 12 Hours he is above the Horizon there, he is not so much Elevated as under the Pole.

POLES of the Ecliptick are Points in the Solstitial Colure 23 Degr. 30 Minut. distant from the Poles of the World; and thro' these all Circles of Longitude in the Heavens do pass, as the Hour Circles do thro' the Poles of the Equator.

To find the Pole of any Circle. See *Spherick Geometry*.

POLEMICAL, is a Word used in reference to that part of Theology which relates to Controversie; which because of the Wars, Jars, and Squabbles, that usually arise about Controverted Points, is called *Polemical Divinity*.

POLICY of *Affurance*, is a Form of Security; mentioned in 43 *Eliz. cap. 12*, & 14; and also in 14 *Car. 2. cap. 23*. and given by a certain Society of Men formed into a kind of Corporation, to any Person to Insure the safe Return of the whole or any part of a Ship; to Insure Houses against Fire; so that if they are burnt down, they shall be Rebuilt at the proper Charge of the Insurers; and to Insure Mens Lives in Offices when they have paid great Sums for the same; and lastly, to Insure to Persons paying so much Money at once, or becoming constant Contributors to the Office or Society of Assurance, a Remainder of so much Money after the said Contributor or Subscriber's Death. This Policy of Assurance is under the Seal of the Office, and entitles the Person Benefited by it, to make good his Claim according to the Tenor of the Articles or By-Laws of that Society of which he was a Member.

POLLUX, a fix'd Star in the *Twins*, of the Second Magnitude, whose Longitude is 108 Degrees 47 Minutes, Latitude 6 Degrees 38 Minutes.

POLYACOUSTICKS, are Instruments contrived to Multiply Sounds, as Multiplying-glasses or Polyscopes do Images of Objects.

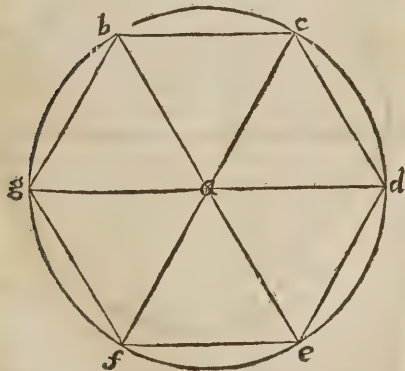
POLYEDRON, the same with *Polyhedron*.

POLYGON, a Term in Geometry, signifying in the general any Figure of many Sides and Angles; tho' no Figure is called by that Name, unless it have more than four or five Sides.

And if all the Sides and Angles be equal, then 'tis called a *Regular Polygon*.

For its Superficial Content, see *Area*.

Every *Polygon* may be divided into as many Triangles as it hath Sides.



If you take a Point, as *a*, any where within the *Polygon*, and from thence draw Lines to every Angle, *a b*, *a c*, *a d*, &c. for they shall make as many Triangles as the Figure hath Sides.

The Angles of any *Polygon* taken together, will

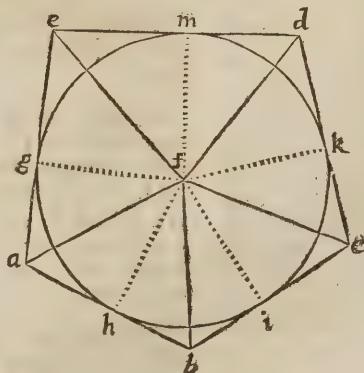
make twice as many Right ones, except four, as the Figure hath Sides.

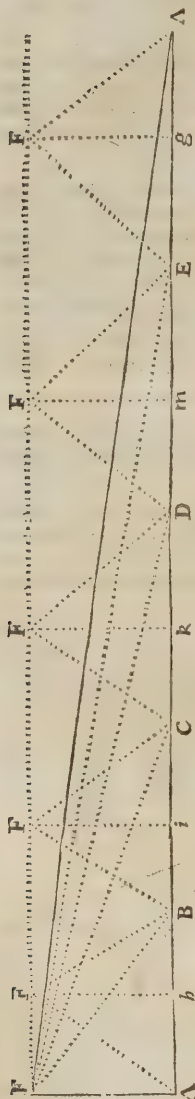
Thus, if the *Polygon* have six Sides, (as in the Figure above) the double of that is 12; from whence take 4, there remains 8. I say, that all the Angles *b, c, d, e, f, g*, of that *Polygon* taken together, are equal to 8 Right Angles.

For the *Polygon* having 6 Sides, is divided into 6 Triangles; and the 3 Angles of each, by 1. *Eucl.* are equal to 2 Right ones; so that all the Angles together make 12 Right ones: But each of these Triangles hath one Angle in the Point *a* and by it they compleat the Space round the said Point; and all the Angles about a Point are known to be equal to 4 Right ones; wherefore those 4 taken from 12, leave 8, the Sum of the Right Angles of the *Hexagon*.

So that 'tis plain, the Figure hath twice as many Right Angles, as it hath Sides, except 4. *Q. E. D.*

Every *Polygon* circumscribed about a Circle, is equal to a Rectangled Triangle, one of whose Legs shall be the Radius of the Circle, and the other the *Perimeter* (or Sum of all the Sides) of the *Polygon*.





Let the Line FA be equal to Radius fb , and to it at Right Angles draw the Infinite Line $ABCD$, &c. out of which take $Ab = ab$, $bB = bb$, $Bi = bi$, and $iC = ic$, &c. So that the whole Line $ABCDEA$, may be equal to the whole Compass or Perimeter of the Polygon $abcde a$.

Also draw FF parallel to AA ; so that all the Perpendiculars Fb, Fi, Fk , &c. may be equal to the Radius fb, fi, ik , &c.

'Tis then plain, That the Triangle AFB will be equal to the Triangle afb in the Polygon and the $\triangle BFC = \triangle bfc$, also the $\triangle CFD = \triangle cfd$, &c. So that all these Triangles taken together, will be equal to all these in the Polygon, or to the whole Polygon.

But the $\triangle FAA$ is equal to all the \triangle s within the Parallels; because drawing the Lines BF, CF, DF , &c. The $\triangle FAB$, will be equal to the $\triangle FbA$; the $\triangle FCB = \triangle fCB$, &c.

Wherefore the Triangle FAA is equal to the Polygon, which was to be proved.

COROLLARY I.

Hence every Regular Polygon is equal to a Right-angle Triangle, one of whose Legs is the Perimeter of the Polygon, and the other a Perpendicular drawn from the Centre to one of the Sides of the Polygon.

COROLLARY II.

And every Polygon circumscribed about a Circle, is bigger than it; and every Polygon inscribed, is less than the Circle, as is manifest; because the thing containing, is always greater than the thing contained.

COROLLARY III.

The Perimeter of every Polygon circumscribed about a Circle, is greater than the Circumference of that Circle; and the Perimeter of every Polygon inscribed is less.

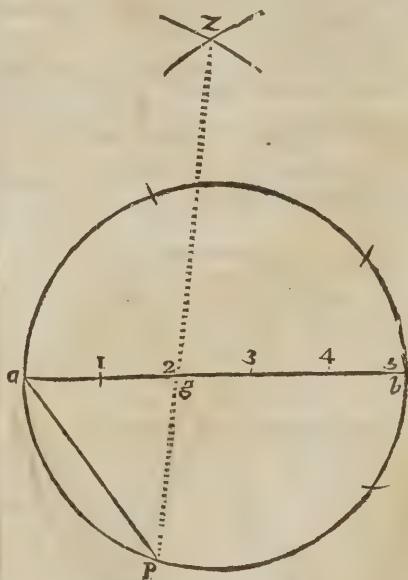
Hence,

A Circle is equal to a Right Angled Triangle, whose Base is the Circumference of the Circle and its Height the Radius of it.

For this Triangle will be less than any Polygon circumscribed, and greater than any inscribed, (because the Circumference of the Circle, which is the Base of the Triangle, is greater than the Compass of any inscribed;) Therefore it will be equal to the Circle. For if this Triangle be greater than any thing that is bigger than the Circle, and less than any thing that is less than the Circle; it follows, that it must be equal to the Circle.

This is called the Quadrature or Squaring of the Circle; that is, to find a Right-lined Figure equal to a Circle; upon this Supposition, That the Base given, is equal to the Circumference of the Circle, but actually to find the Right Line equal to the Circumference of a Circle, is not yet discovered Geometrically.

To inscribe any Polygon in a Circle.



Divide ab , the Diameter of the Circle, into as many equal Parts as the Polygon is to have Sides; (viz. 5.) and then with the Length of that whole Diameter make two Arks intersecting each other above, as in z ; and lay a Ruler from z thro' g , the second Division of the Diameter, which will find below the Point p . So is the Chord ap the Side of the Polygon required; which here is a Pentagon.

POLYGON,

POLYGON *Exterior*, in Fortification, is the Distance of one Point of a Bastion from the Point of another, reckoned all round the Work.

POLYGON *Interior*, is the Distance between the Centres of any two Bastions, reckon'd all round as before.

POLYGONAL Numbers, are such as are the Sums or Aggregates of *Series* of Numbers in Arithmetical Progression, beginning with Unity; and so placed, that they represent the Form of a *Polygon*. Thus,

.
1	3	6	10	

are Triangular Numbers, because they are the Aggregates of a certain Number of Points placed in the Form of Triangles, &c.

.
1	4	9	16	

are Quadrangular Numbers, &c.

POLYGRAM, is a Geometrical Figure consisting of many Lines.

POLYHEDROUS Figure, in Geometry, is a Solid contained under or consisting of many Sides; which, if they are *Regular Polygons*, all Similar and Equal, and the Body be inscribable within the Surface of the Sphere, 'tis then called a *Regular Body*. See that Word.

POLYNOMIAL, or *Multinomial Roots*, in Mathematicks, are such as are composed of many Names, Parts, or Members; as,

$$a + b + d + c.$$

In *Philos. Transf.* N. 230. you have a curious Method of raising an Infinite *Multinomial* to any Given Power; or of extracting any Given Root out of such Power: Which was discovered from Sir Isaac Newton's Theorem for raising a *Binomial* to any Given Power, or Extracting the Root of the same, by that Ingenious and Excellent Algebraist Mr. *Abr. de Moivre*.

POLYPETALOUS Flower, is the Term in Botany for the Flower of a Plant which consists of more than Six distinct Flower-leaves set round to form it; and which fall off singly.

POLYPUS, is a Swelling in the Hollow of the Noftrils, and is Two-fold; either like a Tent, and then it goes by the general Name of *Sarcoma*; or such an one that has a great many distinct Branches or Feet, which extend either to the Outside of the Nose, or the Inside of the Mouth. Their Colour is White, oftentimes Reddish, and sometimes Black and Livid.

Excrescencies of this Nature happen not only in the Noftrils, but sometimes in the Heart, and in the Cavities of the thicker Membrane of the Brain. *Blanchard*.

POLYSCOPES, or *Multiplying Glasses*, are such as represent to the Eye one Object as many.

POLYSPASTUM, a Term in Mechanicks, the same with the *Trochlea* or *Pully*.

POLYSPERMÆ *Plantæ*, are such Herbs or Plants as have more than Four Seeds succeeding

each Flower, and this without any certain Order or Number.

These Mr. Ray makes to be a distinct kind of Herbs, calling them *Herbæ semine nudo Polyperme*: Where by *Semine nudo* he means such Seeds as do not put off, spontaneously the Integuments or Coverings which they either have, or appear to have, but fall covered with it from the Mother-Plant.

These kind of Herbs he divides into Two sorts.

I. Such as have a *Calyx* or *Perianthium* to their Flower; and this consisting either of,

1. *Three Leaves*; the Flower also being *Tripetalous*, or having but Three Leaves: As, the *Plantago Aquatica*, and the *Sagittaria*, both Water-Plants.

Or where the Flower is *Polypetalous*, and the *Calyx* falling together with the Flower; as in the *Chelidonium minus*; or remaining after the Flower is dropt, as in the *Hepatica Mobilis*.

2. *Five Leaves*; in some *Deciduous* with the Flower, as in the *Ranunculus*, In others *Perennial*, as in the *Helleborus niger ferulaceus*; or *Annual*, as in the *Flos Adonis*.

3. *Eight Leaves*; as the *Malva* and *Alcea*.

4. *Ten Leaves*; as the *Carrophylla*, *Fragraria*, *Pentaphyllum*, *Tormentilla*, *Argentina*, *Althea*, and *Pentaphylloides*.

II. Such as have no *Calyx* or *Perianthium*; as the *Clematis*, *Pilipendula*, *Ulmaria*, *Anemone Nemorum*, *Pulsatilla*, &c.

POMIFEROUS Herbs, are (according to Mr. Ray) such as have the largest of Fruit of any Plants whatever, and this covered with a thick hard Rind or Bark; by which they are distinguished from the *Bacciferous Herbs*, which only have a thin Skin over the Fruit.

These kind of Plants have a naked *Monopetalous* Flower, divided into Five Jaggs or Partitions, and growing on the top of the succeeding Fruit. And these either are,

1. *Capreolate*, or creeping along the Ground, &c. by means of their Tendrils, (*Capreoli*) as the *Cucurbita*, *Melo*, *Cucumis*, *Cepo*, *Belfamina*, *Anguria*, and *Colocynthis*. Or,

2. Without *Capreoli* or Tendrils; as the *Cucurbita Clypeata*, or *Melo-Cepo*, *Clypeiformis*.

POMIFEROUS Trees, (see *Trees*) are such as have their Flower on the top of the Fruit, and their Fruit in the Form of an Apple or Pear.

POMPHOLIGODES, Urine with many Bubbles upon it; which are frequent, if the Body be puffed up or painted. *Blanchard*.

POMUM *Adami*, is a Protuberance in the Fore-side of the Throat; so called, because 'tis foolishly thought a piece of the Apple stuck in *Adam's* Throat, as part of his Punishment, and hence derived to his Posterity. *Blanchard*.

In Reality 'tis only the Convex part of the first Cartilage of the *Larynx*, called *Scutiformis*. This is greater in Men than Women.

PONE, is a Writ, whereby a Cause depending in the County Court, or other Inferior Court, is removed into the Common-Pleas.

PONE *per Vadium*, is a Writ to the Sheriff to take Surety of one for his Appearance at a Day assigned.

PONENDIS *in Affisis*, is a Writ founded upon the Statute of *West. 2 cap. 38.* and upon the Statute *Articuli Super Chartas*, cap. 9. Which Statutes shew what Persons Sheriffs ought to impanel upon *Affises* and Juries, and what not.

PONENDUM *in Ballium*, is a Writ commanding a Prisoner to be bailed, in Cafes Bailable.

PONENDUM *Sigillum ad exceptionem*, is a Writ whereby the King willeth the Justices, according to the Statute of *Westm. 2.* to put their Seals to Exceptions laid in by the Defendant against the Plaintiff's Declarations, or against the Evidence, Verdict, or other Proceedings before the Justices.

PONS *Cerebri*, (by some) is a Congeries or Heap of innumerable Filaments divaricated out of the Solider Substance of the Brain, whence all the Nerves take their Rise.

PONTAGE, is a Contribution towards the Maintenance or Re-edifying of Bridges. It may also signifie Toll taken to this Purpose of those that pass over Bridges.

PONTIBUS *Reparandis*, is a Writ directed to the Sheriff, &c. willing him to charge one or more to Repair a Bridge, to whom it belongeth.

PONTON, in Fortification, is a Bridge made of two Boats, at some Distance one from another, both covered with Planks; as also the Internal Space berwixt them. They have Props and Rails on each side; and the whole Structure ought to be so solid, as to be able to transport the Horse, together with Cannon and Baggage, as well as the Infantry.

PONT *Volant*, or the *Flying Bridge*, used in Sieges, is made of two small Bridges laid one over another; and so contrived, by the means of Cords and Pulleys placed along the sides of the Under Bridge, that the Upper can be pushed forwards 'till it joins the Place where it is to be fixed; But however the whole Length of both these Bridges must not be above Four or Five Fathom long, lest they should break with the Weight of the Men. These are chiefly used to surprize Out-works or Posts that have but narrow Moats.

POOP of a Ship, is the Floor or Deck over the Round-house or Master's Cabin, being the highest or uppermost part of her Hull; *a-stern*.

POPLITEA *Vena*, is the Vein of the Ham, and sometimes reaches down the back of the Leg even to the Heel. This comes from the *Iliacal* Branches of the *Vena Cava*; which, after they descend as low as the Thighs, are called *Cruales*.

POPLITEUS, by some called *Subpopliteus*, is a Muscle of the Leg, which ariseth with a short strong Tendon from the External Head of the Inferior *Appendix* of the *Os Femoris*; from whence descending obliquely over the Juncture, becomes fleshy, and expanding it self, is so inserted to the Superior part of the *Tibia* internally, immediately below its Superior *Appendix*. This assists the other Muscles in bending the *Tibia*, and also Antagonizeth the *Biceps*, by turning the Foot and Toes outwards when we sit with our Knees bended.

PORES, are small Interstices, Spaces, or Vacuities between the Particles of Matter that constitute every Body, or between certain Aggregates or Combinations of them. Thus, for Instance, those little imperceptible Holes in the Skin, thro' which the Sweat and Vapours insensible breath out of the Body, are called *Pores*; and the having of such Holes or *Pores* in any Body, is called *Porosity* or *Porosity*.

The Honourable Mr. Boyle has written a Particular *Essay* on the *Porosity* of Bodies; in which he proves, That the most Solid Bodies that are, have some kind of *Pores*. And indeed, if they had not, all Bodies would be alike *Specifically* weighty.

PORIME, (Gr. *ποριμα*) in Geometry, is a Theorem or Proposition to easie to be demonstrated, that 'tis almost self-evident; as, *That a Chord is all of it within the Circle*. And on the contrary they call that an *Aporime*, which is so difficult as to be almost impossible to be demonstrated; as the *Quadrature of the Circle* is now, and as the Squaring of any Assigned Portion of *Hippocrates* his Lunes was, 'till a little while ago.

PORISME, *Proclus* and *Pappus* define this Geometrical Term to signifie a kind of Theorem, in the form of a Corollary, which is dependant upon, or deduced from some other Theorem already demonstrated. And 'tis commonly used to signifie some General Theorem, which is discovered from finding out some Geometrical Place: As, for Instance, if a Man hath found out by Algebra, or any other Method how to Construct a *Local Problem*; and from that Place so constructed and demonstrated, hath deduced some General Theorem, that Theorem is by the Geometrick Writers called a *Porism*. Of these *Porisms*, Mr. Ozanam, in his *French Mathematical Dictionary*, gives many useful Instances; which see.

PORISTICK Method, in Mathematicks, is that which determines *when, by what way, and how many different ways*, a Problem may be resolved.

POROCELE, is a Rupture proceeding from Callous Matter, or the Stone. *Blanchard*.

POROTICA, are Medicines, which, by drying, thickening, and astringent Qualities, turn part of the Nourishment into Brawny, Callous Matter. *Blanchard*.

POROSITY. See *Pores*.

PORTA, the same with *Vena Porta*.

PORT the Helm, a Sea-Term, signifying to put the Helm to the Left or Larboard side of the Ship; but however they never say *Larboard the Helm*, but always *Port it*; tho' they say *Starboard the Helm*, when it is to be put to the Right side of the Ship. A Ship is said to *Heel a-port*, when she swims not upright, but leans to the Left side. The Word

PORT, also signifies a Haven or Harbour; as also the Holes in a Ship's side thro' which her Great Guns are put out.

PORT-Last, the same as the *Gun-wale* of a Ship; therefore they say a *Yard is down a Port-Last*, when it lies down on the Deck.

PORTABLE Barometer, was first invented by the Honourable Mr. Boyle, and was effected by making the *Torriceilian* Experiment in a long Glass Tube, sealed at the top, and bent near the bottom up again, parallel to the longer Leg: For by this means the Quick-silver in the open and shorter Leg, supplied the Place of the stagnant Mercury in the *Bason* or *Cistern*. The Instru-

ment

ment was all of one piece, and might easily be carried from Place to Place without spilling the Mercury. By which means, Observations of the Weight of the Atmosphere might be readily made on the Tops of Hills, Bottoms of Mines, &c.

But this open Tube could not be carried about with so much Ease and Safety as those *Portable Barometers* which are now in Use, and which are made by Mr. John Partrick, Torricellian Operator in the *Old Baily*, with very great Exactness and Neatness: For in these there is an Invention to screw the Mercury quite up to the Sealed end of the Tube, by which means it will not swag up and down in the Carriage, and so by its great Weight endanger the breaking of the Tube.

PORTCULLICE, *Herse*, or *Sarazine*, in Fortification, signifies several great Pieces of Wood laid or joined across one another like an Harrow, and at the Bottom it is pointed at the end of each Bar with Iron. These formerly used to hang over the Gate-ways of Fortified Places, to be ready to let down in Case of a Surprise, when the Enemy should come so soon, as that there is no Time to shut up the Gates. But now a-days the Orgues are more generally used, as being found to be much better. See *Orgues*.

PORTICO, or *Porch*, in Architecture, is a long Place cover'd either with a vaulted Roof, or an even Floor, supported by Pillars. But this Word may be applied to signify all manner of Dispositions of Columns in a Gallery.

PORTIONER, where a Parionage is served sometimes by two, or sometimes by three Ministers alternately. The Ministers are called *Portioners*, because they have but their Portion, or Proportion of Tythes or Profits of the Living.

PORTMOTE, signifies a Court kept in Haven Towns, as *Swainemote* in the Forest, and is called the *Portmote Court*.

PORUS Biliaris, or *Meatus Hepaticus*, is a Pipe or Channel passing directly from the Liver to the *Ductus Communis*, and which transmits the Bile from the Liver, by the Intervention of some small Glandules. Within the Liver, its Trunk and Branches are invested with a double Coat: A *Proper* one which it retains also without the Liver; and another common to it and the *Porta*, called *Capsula Communis*, which it hath from the Membrane of the Liver. In this Common Coat, this *Porus* and the *Porta* are so closely enwrapped, that at first they appear but one Vessel; but if you hold them up to the Light, you will discover Vessels of two Colours; and then you may dexterously rip up the *Capsula*, and so lay them open. Its Roots within the Liver are equally divided with those of the *Porta* every where, except in that little Space where the Roots of the *Vesica* are spread in the Right side of the Liver; and they are both larger and more numerous than those of the *Vesica*, drawing Choler from all Parts of the Liver almost. And this *Porus Biliaris* seems to be a more necessary Part than the Gall-Bladder, or *Vesica*; because in many Creatures, as Red and Fallow Deer, Horses, &c. the *Vesica* is wanting, but none want this. Without the Liver, 'tis as wide again as the *Meatus Cysticus*, with which it joins at two Inches Distance from the Liver; and so both make up the *Ductus Choledochus Communis*. The *Porus* hath no Valve in its whole Progress; only the *Ductus Communis*, at its Entrance into

the Intestines, having pierced the Outer Coat, passes between *that* and the Middlemost Coat, for about the 12th part of an Inch; and then piercing *that* also, marches down farther between it and the Inner Coat of the Gut, for about half an Inch, and at last opens with a round Mouth into the Intestine: So that this Oblique Insertion (like that of the Ureters into the Urinary Bladder) serves instead of a *Valve*, to hinder any thing from Regurgitating out of the Guts into this Duct: And this is farther prevented also by the flaggy, loose Constitution of the Inner Tunick of the Guts; which, when any thing would enter, the Mouth of the *Porus* claps close upon it, and stops it. There are no *Anastomoses* between the Roots of this Duct and those of the *Porta*, as have been often said; For the Extreme Capillary Twigs of the *Porus* terminate in the *Parenchyma* of the Liver, out of whose Glandules, they imbibe the Choler, there separated from the Blood.

POSITION, or *Site*, is an Affection of Place, and expresses the Manner of any Bodies being in a Place: This therefore is not *Place*, nor indeed hath it any Quantity; as Sir Is. Newton well observes in *Princip. Mathem.* p. 6.

POSITION, or the *Rule of Position*, otherwise called the *Rule of Falshood*, is a Rule in Arithmetick, wherein any Number is taken to work the Question by, instead of the Number sought; and so by the Error or Errors found, we find the Number required.

This *Rule of False Position* is of two kinds, *viz.* *Single* and *Double*.

POSITION Single, is when there happens in the Proposition some Partition of Numbers into Parts Proportional; and then at one Operation the Question may be resolved, by this Rule.

Imagine a Number at pleasure, and work there^d with according to the Tenor of the Question, as if it were the true Number; and what Proportion there is between the False Conclusion and the False Position, such Proportion hath the Given Number to the Number sought: Therefore the Number found by Argumentation shall be the first Term of the *Rule of Three*, and the Number supposed shall be the second Term, and the Given Number shall be the third Term.

Example.

Three Men, *A. B.* and *C.* consent to buy a Ship for 220 *l.* So that *B.* must pay twice as much as *A.* and *C.* four times as much as *B.* How much must each Man pay?

Answer. Suppose *A.* paid 8 *l.* then (according to the Question) *B.* must pay 16 *l.* and *C.* four times as much, *i. e.* 64 *l.* But all these Numbers added together, make no more than 88 *l.* whereas there should be 220 *l.* Yet by the help of this Number, I say, If 88 *l.* come of 8 *l.* of what comes 220 *l.* wherein the Work is gain'd 20 *l.* for the Part of *A.* Then *B.* must pay 40 *l.* and *C.* 160; which added together, give 220 *l.* the Number propounded.

	<i>Position false.</i>	<i>Conclus. true.</i>
<i>Position</i> 8	88 l. : 8 l. : 220 l. : 20 l. <i>A.</i>	
<i>Double</i> 16		40 <i>B.</i>
<i>Quadruple</i> 64		160 <i>C.</i>
	88	220 <i>Proof.</i>

If there be a Fraction or Fractions in the Question, then for more Facility in Proceeding take such a Number for the *Position* as may be equally parted by the Parts exprest in the Question.

In Questions propounded, it happens sometimes that a Number stands unalterable by the Fractions given, and so may be subtracted from the Sum given, and let by 'till the Operation be made with the rest, and then restored again.

POSITION Double, is when there can be no partition in the Numbers to make a Proportion: Therefore you must make a Supposition twice, proceeding therein according to the Tenor of the Question; and if either of the supposed Numbers happens to solve the Proposition, the Work is done; but if not, observe the Errors, and whether they be greater or lesser than the Resolution requireth, and mark the Errors accordingly, with the Signs + or -

Then multiply contrariwise the one *Position* by the other Error; and if the Errors be both too great, or both too little, subtract the one Product from the other, and the one Error from the other, and divide the Difference of the Products by the Difference of the Errors.

But if the Errors be unlike, as the one +, and the other -, add the Products, and divide the Sum thereof by the Sum of the Errors added together: For the Proportion of the Errors is the same with the proportion of the Excesses or Defects of the Numbers supposed, to the Numbers sought.

Example.

Two Men, *A.* and *B.* discoursing of their Money; *A.* says to *B.* If I had two of your Pieces, I should have twice as many as you have; to which *B.* replies, If I had two of yours, I should have just as many as you have: How many had each?

Suppose *A.* had 16, to which 2 being added makes 18, which is twice 9; but having taken 2 from thence, it must be by this Supposition that *B.* had 11: Wherefore 2 taken from 16, and added to 11, makes 13 for *B.* and *A.* 14. But they should be equal; therefore the *Position* is erroneous, and the Error too much by 1.

Again, Suppose *A.* had 20, then $20 + 2 = 22$. that is twice 11; but from thence 2 being taken, *B.* must have 13. Now 2 from 20, and put to 13, gives 15 for *B.* and leaves 18 for *A.* which is not equal; therefore the Error again is 3 too much.

Then multiplying 16 the first *Position*, by 3 the second Error, and also 20 the second *Position*, by 1 the first Error; the Product 20 is taken from the Product 48, (because the Errors are both + and the remainder 28 is the Dividend; and the lesser Error 1 subtracted from the greater Error 3, leaves 2 for the Divisor; the Quotient of which Division will be 14, the Number sought for

A. and then by consequence *B.* must have 10: For 2 taken from 10, and added to 14, make 16 = twice 8; 2 taken from 14, and put to 10, makes 12 both alike.

<i>First</i>	<i>Second</i>
<i>Position</i> 16	20 <i>Position.</i>
Error 1+	3+ Error.
20	48

<i>Products</i> 48 - 20	= 28	(14 <i>A.</i>
<i>Errors</i> 3 - 1	= 2	10 <i>B.</i>

Proof.

14 + 2 = 16	} half.
10 - 2 = 8	
14 - 2 = 12	
10 + 2 = 12	} equal.

If the Suppositions had been 12 and 10, the Errors being both -, the Operation would have stood thus, as before, because the Errors are alike.

<i>First</i>	<i>Second</i>
<i>Position</i> 12	10 <i>Position.</i>
Error 1-	2- Error.
10	24

<i>Products</i> 24 - 10	= 14	(14 <i>A.</i>
<i>Error</i> 2 - 1	= 1	10 <i>B.</i>

But if the Suppositions are 20 and 16, then the Errors being found unlike; the Sum of the Products must be the Dividend, and the Sum of the Errors the Divisor.

<i>First</i>	<i>Second</i>
<i>Position</i> 20	10 <i>Position.</i>
Error 3+	2- Error.
30	40

<i>Product</i> 30 + 40	= 70	(14 <i>A.</i>
<i>Errors</i> 3 + 2	= 5	10 <i>B.</i>

Note. 1. That as well in the *Single* as in the *Double Rule of Position*, tho' the Number supposed be never so false, a Resolution may be had thereby: Yet for more Ease in the Operation, suppose a Number that may be parted equally into so many Parts as are necessary to the Resolution of the Question.

- Let the Second *Position* be always *Homogeneous*, or of the same kind with the first; that is, belong both to one Man, one Thing, &c.
- If both the Errors be equal in Numbers, and yet their Signs unlike, half of both the *Positions* is the Sum desired.
- All the Propositions resolved by *Single Position*, will be resolved by *Double Position*.

POSITIVE of Degree of Comparison in Grammar, is that which signifies the Thing simply and absolutely, without comparing it with others; it belongs only to *Adjectives*.

POSITIVE *Levity*. See *Levity*.

POSITIVE *Quantities* in *Algebra*, are such as are of a Real and Affirmative Nature, and either have, or are supposed to have the Affirmative or Positive Sign + before them, and 'tis always in opposition to the *Negative Quantities*, which are defective, and have this Sign— before them.

POSSE *Comitatus*, a Term in Law, signifying the Aid and Attendance of all Knights, Gentlemen, Yeomen, Labourers, Servants, Apprentices, and all others, above the Age of Fifteen Years within the County; except Women, Ecclesiastical Persons, and such as are decrepid, or labour of an Infirmary: And the Statute of 2 H. 3. cap. 8. says, *That Persons able to Travel, shall be assistant in this Service*, which is used where a Possession is kept upon a Forcible Entry, or any Force of Rescue used, contrary to the Command of the King's Writ, or in opposition to the Execution of Justice.

POSSESSION, in a Legal Sense, is taken twofold, *Actual* and *in Law*: *Actual Possession* is, when a Man actually enters into Lands and Tenements to him descended. *Possession in Law*, is when Lands or Tenements are descended to a Man, and he hath not as yet actually entered into them. As for Example.

Before or until an Office be found of Lands Escheared by an Attainder, the King hath only a *Possession in Law*, and not in *Deed*: There is also a Unity of *Possession*, which the *Civilians* call *Consolidationem*. If the Lord purchase the Tenancy held by *Heriot Service*, then the *Heriot* is extinct by Unity of *Possession*; that is, because the Seignior and the Tenancy are now in one Man's *Possession*.

POSSESSIVES, in Grammar, are such *Adjectives* as signify the Possession of, or Property in some Thing.

POSTEA in Law, is the Return of the Proceeding by *Nisi prius*, into the Court of *Common-Pleas*, after a Verdict, and there afterwards Recorded.

POST-Brachiale, vid. *Metacarpus*.

POST Diem, is the Return of a Writ after the Day assigned, for which the *Custos Brevirum* hath four Pence, whereas he hath nothing if it be returned at the Day; sometimes it is taken for the Fee it self.

POST Disseisin, is a Writ given by the Statute of *Westm. 2. cap. 26.* and lies for him that having recovered Lands or Tenements by *Præcipe quod reddat* upon the Default or Reddition, is again disseised by the former Disseisor.

POST Fine, in Law, is a Duty belonging to the King, for a Fine, formerly acknowledged before him in his Court, which is paid by the Cognisee, after the same is fully passed, and all things performed touching the same; the Rate thereof is so much, and half so much as was paid to the King for the Fine, and is Collected by the Sheriff of the County, where the Land, &c. lies whereof the Fine was levied, to be answered by him into the Exchequer.

POST Terme, is a Return of a Writ, not only after the Day assigned for the Return thereof, but after the Term also; for which, the *Custos brevium* takes the Fee of Twenty Pence; sometimes also it is taken for the Fee it self.

POSTERN, in Fortification, is a false Door usually made in the Angle of the *Flank*, and of the *Curtain*, or near the *Orillon* for private Sallies.

POSTICUM, is the *Postern-Gate*, or *Back-Door* of any Fabrick.

POSTULATES, or *Demands* in *Mathematicks*, &c. are such easy and self-evident Suppositions as need no Explication or Illustration to render them Intelligible. As,

That a Right Line may be drawn from one Point to another.

That a Circle may be described on any Centre given, of any Magnitude, &c.

POSTULATION, (in the Law) is made up on the Unanimous Voting of any Person to a Dignity or Office, of which he is not capable by the Ordinary Canons or Statutes, without special Dispensation.

POTANS, or *Potence*, a Part of a Watch; see under *Balance*.

POTENT, or *Potence*, the Term for a Cross in Heraldry, formed into this Figure.

He beareth Sable, a Cross Potent, Or, by the Name of *Aleyn*.

This form represents the upper end of a Crutch; for Anciently Crutches were called *Potenti*.

POTENT, *Counter Potent*, a Term in Heraldry: See *Vairy Copy*.

POTENTIAL Coldness, is a Relative Quality which some Drugs, Simples, or Compound Medicines are supposed to be endowed with: And therefore you will find frequently in some Old Books, or in the Writings of such as follow the Old Physicians, that such a Plant or Drug, is cold in the 2d or 3d Degree: The meaning of which, is, not that such a Plant is actually Cold to the Touch, but that it is Cold in its Effects and Operations, if taken Inwardly. And whenever such an Effect doth follow the taking of such Medicine, Mr. Boyle thus accounts for it according to the Mechanical Philosophy, viz. That this Body, which they call *Potentially Cold*, is made up of *Corpuscles* of such a Size, Shape, &c. that being disjoined and resolved by the *Menstruum* of the Stomach, or the Fluids it may elsewhere meet with, they do so intimately associate themselves with the small parts of the Blood and other Liquors, as by clogging and impeding them to lessen their wonted Agitation; and perhaps also to make them act in a peculiar way, as well as less briskly on the Nervous and Fibrous parts of the Body: The Perception of which *Imminution*, or perhaps *Change* of Motion in the Organs of Feeling, is that, which being referred to the Body that produced it, is called *Potential Coldness*.

Hence, if it be supposed that in Agues some Morbifick Matter of a viscid, or not easily dissolvable Texture, be harboured in some part of the Body, and requires such a Time to be made fluid and resolvable, which is an *Hypothesis* generally received, the Cold Fits in these Diseases, will be plausibly accounted for.

Also the Shiverings and Cold arising from the taking of most Poisons, may hence be solved; and that lesser Degree of it which seizes *Hypochondriack* and *Hysterical* Persons.

POTENTIAL Mood in Grammar, is the same, in form with the *Subjunctive*; but differs in this

. That



That it hath always Implied in it, either *Poffum*, *Volo*; or *Debeo*; as *Roget Quis*, that is, *Rogare poffe*, a Man may ask. 'Tis fometimes called, The *Permiſſive Mood*, becauſe it implies often a Permiſſion or Conceſſion to do a thing: As

Habeat, valeat, vivat cum illa.

Terent.

POUR *fair proclamee, que null inject fines ou ordures en foffes, en rivièrs pres Cityes*, &c. is a Writ directed to the Mayor, Sheriff, or Bailiff, of a City or Town, commanding them to proclaim, That none caſt Filth into the Ditches or Places near adjoining, and if any caſt already, to remove it.

POUR Party, is a Term in Law, contrary to *pro indiviſo*; for to make *Pour party*, is to divide and ſever the Lands that fall to *Parcener*, which before Partition they hold jointly, and *pro indiviſo*.

POUR Seisir Terres la feme que tient en Dowry, &c. was a Writ whereby the King Seized upon the Land, which the Wife of his Tenant that held *in Capite*, deceased, hath for her Dowry, if she Married without his Leave; and is grounded upon the Statute of the King's Prerogative.

POUR Suivant, ſignifies the King's Meſſenger attending upon him in his Wars, or at the Council Table, Exchequer, in his Court, or his Chamber, to be ſent upon any Occaſion or Meſſage; as for the Apprehending of a Perſon Accuſed, or Suſpected of any Offence: Thoſe that be uſed in Martial Cauſes, are called *Purſuivant at Arms*, others are uſed upon Meſſages in time of Peace, and eſpecially in Matters touching Jurisdiction.

POURVEYANCE, is the providing, Corn, Fuel, Victual, and other Neceſſaries for the King's Houſe.

POURVEYOR, ſignifies an Officer of the King or Queen, or other great Perſonage, that provideth Corn and other Victual for their Houſe.

POWCHES, ſo the Seamen call ſmall Bulkheads made in the Hold of a Ship, to ſtow Corn, Goods, or the like, that it do not ſhoot from one ſide to the other.

POWERS in Algebra, are Numbers ariſing from the Squaring or Multiplication of any Number or Quantity by it ſelf, and then that Product by the Root or firſt Number again; and this Third Product by the Root again; and ſo on *ad Infinitum*; as, 2, 4, 8, 16, 32, 64, 128, 256, &c. Where 2 is called the Root or Firſt Power, 4 is the Square or Second Power, 8 is the Cube or Third Power, 16 is the Biquadrate or Fourth Power, &c. And theſe Powers in Letters or Species, are expreſſed by repeating the Root as often as the Index of the Power expreſſes, thus; *a* is the Root or Firſt Power, *a a* the Square or Second Power, *a a a* the Cube, *a a a a* the Biquadrate or Fourth Power. And to avoid the tediousneſs of repeating the Root ſo often when the Powers are high, we only put down the Root with the Index of the Power over it, thus: *a*⁹, that is the ninth Power of *a*; *b*¹⁶, *b*⁹⁴, are the ſixteenth or the ninety fourth Powers of *b*.

POWERS, Mechanicks, are the Six Mechanical Faculties; the Balance, the Lever, the Wheel, the Pulley, the Wedge, and the crew; which are uſually ſtiled the Six Mechanical Powers. The Force alſo or Strength brought for the

moving of any Weight by any Engine, is called the Power. And the deſign of Mechanicks, is to teach Men how to add ſuch a fitting Supplement to the Power, as that it may move any Weight required, with facility and cheapneſs, and in as little room as may be. See Vol. II.

POWERS of Lines, or Quantities are their Squares, Cubes, &c. or other Multiplications of the parts into the whole, or of one part into another.

POYNING's Law, is an Act of Parliament made in Ireland by Hen. 7. and ſo called, becauſe Sir Edward Poyning was Lieutenant there, when it was made; whereby all the Statutes in England were made of Force in Ireland, which before that time were not, neither are any now in force there which were made in England ſince that time.

PRACTICE in Arithmetick, is a Rule which expeditiouſly and commodiouſly answers Queſtions in the Rule of Three, when the firſt Term is 1, or Unity, and 'tis ſo called from its readineſs in the Practice of Trade and Merchandiſe.

Of this Rule there are ſeveral Ways of Operation; As by

Reduction, or bringing the Price of the Pound, Ell, Yard, &c. into the Loweſt Denomination of uſual Money: The way to do which, ſee under the Word *Reduction*. And this way of Practice will be clear from theſe two Examples.

1. *At 1 s. 2 d. the Pound, what comes 152 Pounds to?*

Bring all into Pence, and ſay, 1 : 14 :: What ſhall 152 give?

Answer.

$152 \times 14 = 2128 \text{ d.}$ which reduced, gives 8 l. 17 s. 4 d.

2. *If 1 Pound coſt 3 s. 6. d. what ſhall the Great Hundred and 5 Pound coſt?*

Reduce 3 s. 6 d. into Six-pences, *i. e.* 7 Six-pences; and becauſe the Great Hundred is 112 l. the Pounds will be 117. Then the Queſtion will ſtand thus.

$1 : 7 :: 117 : 117 \times 7 = 819$ Six-pences; that is, 20 l. 9 s. 6 d.

The other more uſual way of Practice, is by Aliquot Parts. For if the Price fall out to be the Aliquot Parts, or even parts of a Pound, or a Shilling, then the Work may be ſhortened much; thus.

The Even parts of a Shilling are theſe: 6 d. the $\frac{1}{2}$, 4 d. the $\frac{1}{3}$, 3 d. the $\frac{1}{4}$ part, 2 d. the ſixth part, 1 d. ob. the $\frac{1}{8}$ part, and 1 d. the $\frac{1}{16}$ part.

Therefore if any Queſtion, wherein 1 is in the Firſt place, be propoſed, and if any of theſe parts be in the Second; you may find the Fourth Term, by taking the one part of the Third, as in this Example.

At 6 d. the Yard, Pound or Ounce, what comes 74 Yards to?

Answer.

Answer.

1 l. 17 s. By taking the half of 74, which is 37 s. or 1 l. 17 s.

At 3 d. the Tard, what comes 74 Yards to ?

Answer.

18 s. and 6 d. By dividing 74 by 4.

But if the Question fall not right upon any of these aliquot Parts, then you must work oftner ; as,

At 10 d. the Pound, what will 133 Pound give ?

Answer.

5 l. 10 s. 10 d. By dividing 133 by 2 (for 6 d.) it will be 66 s. and 6 d. And then by 3 (for 4 d.) which makes 44 s. 4 d. in all 110 s. 10 d. or 5 l. 10 s. 10 d.

And so for 8 d. take 4 d. twice ; for 9 d. take 3 d. thrice ; for 11 d. take 6 d. 3 d. and 2 d.

The same may be done with the Aliquot Parts of a Pound : And to make this more plain and easie, you have here a compleat Division of the even and uneven Parts of a Pound ; as also the even and uneven Parts of a Shilling.

Even Parts of a Pound.	Parts.	Uneven Parts of a Pound.	Divided into Even Parts.	Parts.
s. d.		s.	s.	
10 00	$\frac{1}{2}$	19	10 5 4	2 4 5
6 8	3	18	10 4 4	2 5 5
5 00	4	17	10 5 2	2 4 10
4 00	5	16	10 4 2	2 5 10
3 4	6	15	10 5	2 4
2 06	8	14	10 4	2 5
2 00	10	13	4 4 5	5 5 4
1 08	12	12	10 2	2 10
1 03	16	11	5 4 2	4 5 10
1 00	20	9	5 4	4 5
0 10	24	8	4 4	5 5
0 08	30	7	5 2	4 10
0 06	40	6	4 2	5 10
		3	2 1	10 20
Even parts of a Shilling.		of a Shilling.	d.	
6 d.	$\frac{1}{2}$	11 d.	6 3 2	2 4 6
4	3	10	6 4	2 3
3	4	9	3 3 3	4 4 4
2	6	8	4 4	3 3
1	12	7	4 3	3 4
1 ob.	8	5	3 2	4 6

The Use of this Table is easily known from what hath been said before.

PRÆCIPE *in Capite*, was a Writ issuing out of the Court of Chancery, for a Tenant holding of the King in Chief, as of his Crown, and not as of any Honour, Cattle, or Mannor.

PRÆCIPE *Quod reddat*, is a Writ of great Diversity, both in its Form and Use ; for which, see *Ingressus* and *Entry*. This Form is extended as

well to a *Writ of Right*, as to other Writs of *Entry* or *Possession*. It's sometimes called a *Writ of Right Close*, as a *Præcipe in Capite*, where it issueth for a Tenant holding of the King in Chief, as of his Crown ; and not of the King, as of any Honour, Cattle, or Mannor : And sometimes a *Writ of Right Patent*, as when it issues out of the Chancery.

cery Patent, that is open to any Lord's Court, for any of his Tenants deforced against the Deforcer, and must be determined there.

PRECARIÆ, are Days Works, which the Tenants of some Mannors are bound, by reason of their Tenure, to do for their Lord in Harvest; called in some Places *Bind-days*, or *Bidden-days*.

PRÆCORDIA, are all the Intrails in the Chest or Thorax.

PRÆMUNIRE, in Logick, is a certain Class or Determinate Series or Order, in which Simple Terms or Words are ranged: Of these they usually account Ten Heads, *viz.* Substance, Accident, Quantity, Quality, Action, Passion, Relation, the Situation of Bodies as to place, their Duration as to Time, their Site or Position, and their Habit or External Appearance.

PRÆMUNIRE, is a Writ that lies where any Man sues another in the Spiritual Court for any thing that is determinable in the King's Court; for which great Punishment is ordained by divers Statutes, *viz.* That he shall be out of the King's Protection, and put in Prison without Bail or Mainprize, 'till he have made Fine at the King's Will, and that his Lands and Goods shall be forfeited if he come not within two Months: And his Providers, Procurators, Attorneys, Executors, Notaries, and Maintainers, shall be punished in the same manner. See the *Statute*. And upon divers other Offences is imposed, by Statutes lately made, the Penalty they incur who are attained in *Premunire*: As by 13 *Elix.* cap. 8. they who are aiding to make a corrupt bargain, whereupon Usury is referred for above Ten Pound in the Hundred for a Year, &c.

PRÆPARANTIA Vasa, in Anatomy, the Preparing Vessels, are the Spermatick Veins and Arteries which go to the Testicles and *Epididymes*: (which see.) They were so called by the Ancients, as thinking they prepared the Seed.

The Arteries are two, and spring from the Trunk of the *Aorta*, about two Fingers Breadth usually, beneath the *Emulgents*; and not from its Side, but out of its Fore-part: The Right whereof climbing over the Trunk of the *Vena Cava*, runs obliquely to the Vein on the same side; and the Left marches to the Vein of that side.

The Veins also are Two: The right arises usually from the Trunk of the *Vena Cava*, a little below the *Emulgent*; the Left from the *Emulgent* it self; for otherwise it must have gone over the *Aorta*, whereby it might have been in danger of being broken; or at least, by the continual Pulse of the Artery, the Recourse of the Venal Blood might have been hindered or retarded.

Both these Arteries and Veins, a little after their Origin, do meet together, and are included in one common Membrane made of the *Peritoneum*; and then they run straight through the Region of the Loins above the Muscles *Psoæ* on each side, and above the Ureters; and as they go, they bestow little Slips here and there on the *Peritoneum*, between whose Duplicatures they descend, and so arrive at its Processess.

The Veins divide very often into many Branches, and then inosculate and unite again; but the Arteries go along by one Pipe only on each side, until within three or four Fingers breadth of the Testicles, where each is divided into two Branches; the Less whereof runs to the *Epididymis*, the Larger to the Testicle: And as they

came down between the Membranes of the *Peritoneum*, so they pass into the *Scrotum* between them; not perforating the Inner in the Processess, as in Dogs and other Creatures, (wherein the Processess of the *Peritoneum* are hollow like a Quill) but in Man the inner Membrane of the *Peritoneum* shuts the Hole, lest the Intestines should fall down through it into the *Scrotum*.

It hath been formerly believed, that there are divers Inosculationes between these Veins and Arteries in their Passage, whereby the Venal and Arterial Blood are mixed together; but since the Circulation of the Blood hath been known, that is discovered to be impossible, because the Blood in the Arteries descends, and that in the Veins ascends. And indeed the Blood for the Elaboration of the *Semen*, and for the Nourishment of the Testicles, flows down by the Arteries only, and that in an even and undivided Course without any of those Vine-like Tendrils, those Turnings and Windings which have formerly so much been spoken of; as *De Graef* by his own frequent Inspection testifies. And the Veins bring back from the *Testes* what remains of the Blood after this; which Veins indeed do come out from their innermost Membrane with almost innumerable Roots, by which they imbibe the refluxent Blood; and they are most admirably interwoven and inosculated with one another 'till about four Fingers breadth above the Testicles, which Space is called *Corpus*, *Pyramidale*, *Plexus*, *Pampiniformis*, and *Varicosus*: But these Veins are so far from Preparing the *Semen*, that they only bring back what is Superfluous from the making of it. Nor indeed can the Arteries justly merit the Name of *Preparing Vessels*, because the Blood they convey to the Testicles acquires no sensible Alteration 'till it come thither. However the Old Names are continued, but 'tis necessary to give this Caution about the Use of these Vessels.

PRÆPOSITION, in Grammar, is an Indeclinable Word, by which a Noun and a Verb are joined together, in order to signify the Cause of any thing, the Time, Place, Conjunction, Privation, &c. 'Tis called *Præposition*, because 'tis most frequently in the Latin Tongue placed before other Words; and this either separately, as *Ad parrem*; or conjunctively, as *Admiror*.

PRÆSEPIA, the Holes of either Jaw, wherein are contained the Teeth.

PRAGMATICAL. A Word commonly in *English* taken in an ill Sense, and is spoken of a Medler, Busic body, or foolish Prater and Tattler about Impertinent Things that do not belong to him. But in Physics, or Natural Philosophy, the Word is sometimes used in a good Signification, and signifies the same as Practical, Mechanical, or Problematical. Thus *Stevinus*, in his *Hydrostatical Elements* calls some Mechanical or Practical Experiments, which he pretends to instruct his Reader how to make, by the Name of *Pragmatical Examples*; and in the same Sense 'tis sometimes used by other Naturalists.

PRAY-Age. See *Age-prior*.

PREAMBLE, in the General, is taken for the Introduction or Beginning of any Discourse: And by the Lawyers, the Beginning of an Act is called *The Preamble*.

PREBEND, is the Portion which every Member or Canon of a Cathedral Church receiveth in the Right of his Place for his Maintenance: And

And these *Prebends* are either *Simple*, or with *Dignity*. *Simple Prebends* are those that have no more but the Revenue towards their Maintenance. *Prebends with Dignity*, are such as have Jurisdiction annex'd to them, according to the divers Orders in every several Church.

PREBENDARY, is he that hath a *Prebend*, and is so called, a *Præbendo auxilium aut consilium Episcopo vel Decano*.

PRECE Partium, is when a Suit is continued by the Assent or Agreement of both Parties.

PRECEPT, in Law, is diversly taken, as sometimes for a Commandment in Writing sent out by a Justice of Peace, or other like Officer, for the bringing of a Person or Records before him. Sometimes it is taken for the Provocation, whereby one Man incites another to commit a Felony, as Theft, Murder, &c.

PRECESSION of the Equinox: In the New Astronomy, the Fix'd Stars are supposed to be immovable, and that the Earth turns round the Sun by its Annual Motion; so that its Axis makes always an Angle of 66 Degrees and an half with the Plane of its Orbit. Now if this Axis were always exactly directed to the same Point of the Heavens, or moved always precisely parallel to it self, as it doth nearly; then the Fix'd Stars would appear to have no other Motion but the Diurnal one. But because in Reality the Axis of the Earth doth a little vary from such an exact Parallelism, and doth not point always precisely to the same Star when it is in the same Place of its Orbit, but makes a small Angle with a Line imagined to lie in the Position it had formerly in the same Place: Hence it happens that the Equinoctial Points, or the common Intersections of the Equator and Ecliptick, do retrocede or move backwards from East to West, about 50 Seconds each Year; and this Motion backwards is by some called the *Recession of the Equinox*, by others the *Retrocession*; and the advancing of the Equinoxes forward by this means is called the *Procession* of them.

PRECIPITATE. Whatever is gotten out of the Pores of a Menstruum, in which it was dissolved, and by some means is precipitated or made fall down to the bottom of the Vessel, may properly be called *Precipitate*. See *Precipitation*. But the Chymists and Writers of Pharmacy commonly give this Name by way of Eminence to the Mercury dissolved in Acid Menstruums, and then afterwards precipitated down to the bottom in fine Powders, of which they reckon these following;

1. *White Precipitate*, which is Mercury dissolved in *Aqua-fortis*; or, which is better, Spirit of Nitre; and then precipitated to the bottom with Salt Water, and a little Spirit of Sal-Armoniack. But if instead of Salt Water, and that Volatile Spirit, you had used hot Urine, a Powder would have fallen down, which may be called,

2. *Rose Precipitate*, since it will be of a Pale Rose Colour.

3. *Red Precipitate*, is Mercury dissolved in Spirit of Nitre, and then the Moisture is evaporated in a Sand-Heat; and then the Fire being gradually encreased to the Third-Degree, the Matter turns Red. Tho' this be called a *Precipitate*, 'tis

improperly so here, being no Precipitation at all. If the Spirit of Vitriol be dropt into a little of this *Red Precipitate*, it presently turns it White; but Spirit of Sal-Armoniack will turn it Grey.

There is also another sort of *Red Precipitate* which the Chymists call *Philosophical Precipitate*, and often *Precipitate per se*; which is by including Running Mercury in a Matras, which is set in a Sand-Heat for Forty Days; or 'till all the Mercury be reduced to a Red Powder.

4. *Green Precipitate*, is made by mingling the Dissolutions of Mercury and Copper together, both made in Spirit of Nitre; the Mixture is evaporated to Driness, and then the Mass at the bottom is powdered, and hath distilled Vinegar poured upon it, and digested with it for Twenty four Hours, or 'till the Liquor looks Green; and a little Bluish; then the Liquor is poured off, and more Vinegar put on, and so repeated 'till all be dissolved: Then all these Dissolutions are mixed and evaporated in a Sand-Heat 'till the Matter be of the Consistence of Honey; then taken off the Fire, it will harden as it cools, and grow pulverizable. The Powder of it is this *Green Precipitate*, as improperly so named as the other *Red ones*.

5. *Yellow Precipitate*. See *Turbith Mineral*.

If Sublimate Corrosive be dissolved in Water, a little Oil of Tartar, *per Deliquium*, poured into the Solution, will make a *Red Precipitate*; and Spirit of Sal-Armoniack will give from some more of the same Solution a *White Precipitate*; and Lime-water will give the Solution a *Yellow Colour*, as you may see in the *Phagedenick Water*: And a little Spirit of Vitriol will clear off these Precipitates and Colours, and render the Liquor greatly transparent and colourless like Fair Water.

All these Precipitates, or any other, may easily be revived into Running Mercury, by mixing them with Quick-lime, and then distilling, as in Reviving Mercury from *Cinnabar*; which see.

PRECIPITATION, in Chymistry, signifies the Falling-down of the Particles of any Metalline or Mineral Body, which are kept suspended in that Menstruum which dissolved it, by the pouring in of some *Alkalizate*, or other contrary Liquor; or by putting something else into it, which is more easie for the Menstruum to dissolve. Thus if Silver be dissolved, and its Particles kept suspended in *Aqua-fortis*, Spirit of Nitre, &c. some Oil of Tartar *per Deliquium*, or even Salt Water, will presently make the Acid let go the Silver, and it will fall down or precipitate to the bottom in a White Powder: Or if into the Solution of Silver you had put a Plate of Copper, this Metal being easier to work upon than the Silver, the Acid will fall to dissolving of it, and consequently let go the Silver, which will soon precipitate or fall down to the bottom, and cover the Copper Plate all over with White Scales. See the Word *Deposuit*.

Mr. Boyle defines Precipitation in General to be an Agitation or Motion of an Heterogeneous Liquor, which in no long time will make the Parts of it subside, and that usually in the Form of a Powder or other Consistent Body.

This Noble Gentleman proposes, That the Corpuscles contained or kept suspended in any

Solvent or Menstruum, may be precipitated down by either or both of these two General ways: 1. By adding to the Weight or Bulk of the dissolved and floating Particles, and thereby rendering them unfit any longer to accompany the Particles of the Menstruum in their Intestine Motion: Or, 2dly, by weakening the Sustaining Power of the Menstruum, and thereby disabling it to keep the dissolved Particles from swimming any longer in it. See more in his Excellent Discourse upon the Mechanical Causes of Precipitation.

PREDIAL Tythes, are those which are paid of Things arising and growing from the Ground only, as Corn, Hay, Fruit of Trees, &c.

PREDICABLE, in Logick, is a common Term or Word that may be attributed to more than one Thing. Thus the Word Triangle refers to any Figure having but three Sides and Angles, whether it be Rectilineal or Spherical.

PREDY, a Sea-word, signifying the same with Ready. *Predy the Ship*, or *Predy the Ordnance*, is, as much as to make Things ready for a Fight. *Predy the Hold*, is lay or stow every thing there in its due order and proper place.

PRIEST's Cap, a Term in Fortification. See *Banner a Prestre*.

PRELUDE, in Musick, signifies any Flourish that is Introductory to Musick which is to follow after.

PREMISES. See *Habendum*.

PREMIUM. A Term used by Merchants for that Sum of Money which the Ensured gives, the Ensurer for the Ensuring the Safe Return of any Ship or Merchandise.

PRENDER, is the Power or Right of taking a Thing before it is offered.

PRENDER de Baron, is usually taken in Law for an Exception, to disable a Woman from pursuing an Appeal of Murder against the Killer of her former Husband.

PREPENSED, in Law, is when a Man is slain upon a sudden Quarrel; yet if there were Malice *prepensd* formerly between them, it makes it Murder; as it is called in some Statutes *prepensd Murder*.

PREROGATIVE Court, is the Court wherein all Wills are proved, and all Administrations taken that belong to the Archbishop by his *Prerogative*; that is, in Case where the Deceased had Goods of any considerable Value out of the Diocess wherein he died; and that Value is commonly 5 l. except it be otherwise by Composition between the said Archbishop and some other Bishop, as in the Diocess of London it is 10 l.

And if any Contention grow between two or more, touching any such Will or Administration, the Cause is properly debated in this Court; the Judge whereof is termed *Judex Curia Prerogativa Cantuariensis*, the Judge of the Prerogative Court of Canterbury.

The Archbishop of York hath also the like Court, which is termed *His Exchequer*; but far Inferior to this in Power and Profit.

PRESBITÆ, are those Men who by Old Age, or other Accidents, have the Globe of the Eye so flat, that the produced Visual Rays pass the *Retina* before they unite; whereby there can be no distinct Vision, since the distinct Base falls too far off beyond the *Retina*: Therefore this Defect is to be helped by Convex-Glasses or Spectacles,

which will make the Rays converge sooner, and, if they are well fitted, exactly on the *Retina*.

PRESCRIPTION, in Law, is when a Man claims any thing, because he, his Ancestors or Predecessors, or they whose Estate he hath, have had or used it all the time whereof no Memory is to the contrary. But one cannot prescribe against a Statute, except he have another Statute that serves for him.

PRESENTATION, a Term in Law, properly used for the Act of a Patron, offering his Clerk to the Bishop, to be instituted in a Benefice of his Gift.

PRESENTÉE, is the Clerk that is so presented by the Patron: Also the King's *Presentée* is he whom the King presents to a Church.

PRESENTMENT, in Law, is a meer Denunciation of the *Jurors* themselves, or some other Officer, as *Justice*, *Constable*, *Searcher*, *Surveyor*, &c. (without any Information) of an Offence Inquirable in the Court whereunto it is presented.

PRESSING to Death. See *Peine fort & dure*.

PREST, is used for a Duty in Money to be paid by the Sheriff, upon his account, in the *Exchequer*; or for Money left or remaining in his Hands.

PRESUMPTION, in Law, is of Three sorts; 1. *Violent*, which is many times a full Proof; as if one be killed in a House, and a Man is seen to come out of the House with a bloody Sword, and no other Person was at that time in the House: This, tho' but a *Presumption*, is as a Proof. 2. *Probable*, which hath but a small Effect. 3. *Levii, seu temeraria*, which is of no Prevalency at all. So in case of a Charter or Feoffment, if all the Witnesses to the Deed be dead; the *Violent Presumption*, which stands for a Proof, is Continual and Quiet Possession.

PRETENCE. See *Escutcheon of Pretence*.

PRETENSED Right or Title, is where one is in Possession of Lands or Tenements, and another who is out, claims and sues for it: Here the *Pretensed Right and Title* is said to him who doth so claim and sue.

PREVARICATE, in Law, is when a Man falsely and deceitfully seems to undertake a Thing, *ea intentione*, that he may destroy it.

PRICK. To *prick* the Chart or Plot at Sea, signifies to make a Point in their Chart whereabouts the Ship is now, or is to be at such a time, in order to find the Course they are to steer, &c.

PRIMA Naturalia, the same with *Atoms*, or *Minima Naturalia*; which see,

PRIMARIUM Latus, in Geometry, is a Right Line in any Conick Section, drawn through the Vertex of the Section, and parallel to the Base of the Cone.

PRIMARY Planets (according to some) are the Three Superior Planets, viz. *Saturn*, *Jupiter*, and *Mars*; but more properly a *Primary Planet* is one that moves round the Sun, as its Centre; whereas a *Secondary Planet* moves round some other Planet.

PRIME Figure, is that which cannot be divided into any other Figures more simple than it self; as a *Triangle in Planes*, the *Pyramid in Solids*: For all Planes are made of the First, all Bodies or Solids compounded of the Second.

PRIME Numbers, in Arithmetick, are those made only by *Addition*, or Collection of Unites, and

and not by *Multiplication*: So an Unite only can measure it; as 2, 3, 4, 5, &c. and is by some called a *Simple*, by others an *Uncompound* Number.

PRIME of the Moon, signifies the *New Moon*, at her first Appearing, or about three Days after the *Change*, at which time she is said to be *primed*.

PRIME Verticals, or *Direct Erect North or South Dials*, are those whose Planes lie parallel to the *Prime Vertical Circle*. But since every Plane hath that Pole raised or depressed thereon, which lieth open to it: Therefore this Plane (if a *Direct South*) hath the South Pole elevated, and consequently the Style (whose Height must be the Complement of the Latitude of the Place) will point downwards.

Wherefore, To find the Hour's Distance from the Meridian upon this Plane, the Proportion is,

As the Radius is to the Sine of the Style's Height, or Co-Latitude;
So is the Tangent of the Hour, or Angle at the Pole.

To the Tangent of the several Hours Distance from the Meridian.

By this Canon, the Hours requisite for the Plane, as also the Half Hours, Quarters, &c. being calculated and set in a Table; the *Dial* is described after the same manner as the *Horizontal Dial*; which see.

North Direct Erect Dials, are but the Backside of the *South*, because lying in the same *Azimuth* with it: Therefore, 'tis no more but turning the *South Dial* upside down, and leaving out the Superfluous Hours between 5 and 7, and 4 and 8, and the *North Dial* is made. Only note, That the Style must point upwards to the North Pole.

PRIMER Seisin. The First Possession or *Seisin* was heretofore used as a Branch of the King's Prerogative, whereby he had the First Possession; that is, the entire Profits for a Year of all the Lands and Tenements whereof his Tenant (that held of him *in Capite*) died *seised* in his Demesne as of Fee, his Heir then being at full Age, until he do his Homage; or if under Age, until he were of Age. But all the Charges arising by *Primer Seisin*, are taken away by the Statute made 12 Car. 2. cap. 24.

PRIMING Iron, is a small sharp Iron which is thrust into the Touch-hole of a Great Gun, and pierces into the Cartridge that holds the Powder, that so they may put in the Prime-powder or Touch-powder to fire off the Piece.

PRIMOGENITURE, in Law, is the Title of an Elder Brother in Right of his Birth.

PRIMORES Dentes, seu *Incisivi Dentes*, are the Four Foremost Teeth in each Jaw; they are pretty-broad, sharp at their Ends, a little convex outwards, and hollow inwards: They have each a pretty long Root, a little crooked, and divided into two, by which means they have the greater Force in cutting off the Aliments, which is their proper Use.

PRIMUM Mobile, in the *Ptolemaick Astronomy*, is supposed to be a vast Sphere, whose Centre is that of the World, and in Comparison of which

the Earth is but a Point: This they will have to contain all other Spheres within it, and to give Motion to them, turning its self and all them quite round in Twenty four hours.

PRINCIPAL, in Common Law, signifies the same with *Heirloom*.

PRINCIPAL Ray, in Perspective, is the Perpendicular one which goes from the Spectator's Eye to the Vertical Plane or the Table. And the Point where this Ray falls on the Table, is called from hence the

PRINCIPAL Point, which some Writers call the Centre of the Picture, and the Point of Concurrence.

PRINCIPLE, a Word very commonly and very variously used; sometimes it signifies the same as a Maxim, an Axiom, or a good Practical Rule of Action: Thus we say, a Person is a Man of Principles, when he always acts, according to the Eternal Rules of Morality, Virtue and Religion.

Sometimes it signifies a Thing Self-evident, and as it were Naturally known, and then 'tis usually called, a *First Principal*; as that, *Nothing can Exist and not Exist at the same time*: That, *Where there is no Law, there is no Transgression*: That a *Whole is greater than a Part*.

Sometimes it hath the same sense with *Rudiments* or *Elements*; as when we say, the *Principles of Geometry, Astronomy, Algebra*; we mean the Doctrine or Rules of those Sciences.

And in Chymistry particularly, 'tis taken for first Constituent and Component Particles of all Bodies, out of which they are made, and into which they are by Fire, as they say, resolvable again. Thus *Salt, Sulphur, and Mercury* are the three Famous Chymical Principles, which they call *Hypostatical*; and the Chymists did formerly pretend, that they could by their Art resolve all Natural Bodies into these; and that these Principles could be drawn Simple, Pure, and Uncompounded from Metals, &c. But since this Art hath been more commonly studied and consequently much better known, it is found to be a Fallacy, as Mr. Boyle excellently shews in his *Sceptical Chymist*; and Lemery hints in many places of his good *Course of Chymistry*.

The Modern Chymists agree that there are five kinds, or different sorts of Bodies, which may by Fire be drawn from many mix'd Natural Bodies, and therefore which may in a large sense be called *Principles*; as *Earth, Salt, Spirit, Phlegm, and Oil*, tho' these can never be drawn, perfectly Pure and Unmix'd; nor have we any reason to believe they are the Constituent Principles of the Bodies they are drawn from; and out of many Bodies hardly ever a one of them can be drawn; and therefore they are not truly and properly the Elements or Constituent Principles of natural Bodies, nor indeed do we know any such.

Of these the *Spirit, Oil and Salt*, are called the *Active* Principles; and the *Water* and the *Earth*, the *Passive* ones.

Mr. Boyle sheweth by many Experiments in his *Sceptical Chymist*, in the Discourse about the *Producibleness of Chymical Principles*, in his Chymical Paradox at the end of his *Noctiluca*, and in many other places that these Chymical Principles are Produci- ble and Destructible, and that they are manifestly Transmutable into one another. For

by distilling what the Chymists call Essential Oil of Aniseeds 36 times over, and some other Oils of Vegetable above 50 times, he found that there would be produced above half the first Weight of the Oil in the form of a Black Pitch. That an acid and volatile Spirit and Salt were to be gained in a considerable quantity; and upon the whole it appeared that these Resulting Bodies of such very different Forms were produced by the Action of the Fire transmuting part of the very Substance of the Oil into them.

That in general may be called a Principle which is the first cause of any Things *Existence*, or *Production*, or of its becoming *Known* to us.

The Aristotelian or Peripatetick Principles are the Four Elements, *Earth, Water, Air, and Fire*.

The Epicurean Principles, are Magnitude, Figure, and Weight.

Mr. Boyle thinks as the World now is (for they can't account for its Creation) that the Mechanical Principles, Matter, Motion, and Rest, are Principles sufficient to solve all the Phenomena of Nature.

The Cartesian Principles are these three following; *First*, A most Subtle Matter very swiftly agitated, fluid, and keeping to no certain Figure but which suits it self to the Figure of those Bodies that are about it; The *Second* are very small Globules, that is, Bodies exactly round, and very solid, continually whirling about, and which do not only like the First Principles, fill up the *Pores* of Bodies, but also constitute the purest Substance of the *Ether and Heaven*. The *Third Principle* is a Matter consisting of more thick and Branchy Parts, full of Angles and unfit for Motion, of which the Earth, Water, Air, and all mixed Bodies do consist.

Now they suppose these Three Elements to be thus produced: The whole World being a Plenum and the Particles, or Atoms, of all Matter solid, as soon as Motion was superinduced into the World, these Atoms being of several Shapes, and Sizes, would begin to rub and grind one against another.

By which means, some would come to be ground or turn'd round Globules; and these constitute their Second Element. The small Chips, Shavings, or Dust, that comes off in the forming of these Globules, is the Matter of their First Element; and these must needs be in a very rapid Motion. But those Particles which are not yet turned into Globular Figures, will be variously angled, and not so fit for Motion as the others; and therefore will constitute a Third Element very different from the others.

PRIORITY, in Law, signifies an Antiquity of Tenure, in comparison of another not so ancient, as to hold by Priority, is to hold of a Lord more anciently than of another.

PRISAGE, is that Custom or Share that belongs to the King, out of such Merchandise, as are taken at Sea by way of Lawful Prize.

PRISM, is a solid Figure, contained under several Planes, whose Bases are Polygons, equal, parallel, and alike situated. Also a Triangular solid glass, thro' which the Sun's Rays being transmitted are refracted into the vivid Colours of the Rain-bow.

The Surface of a Right Prism, is equal to a Parallelogram of the same height, having for its Base a Right Line equal to the Periphery of that

Prism. The same may be said of a Cylinder, because it is but a Prism of Infinite Sides.

The Solid Content of a Prism, is found by Multiplying the Area of its Base by its Perpendicular Altitude.

A Prism is a Triple of a Pyramid of the same Base and Height. See *Proportion of Solids*, where 'tis demonstrated.

PRISMOID, is a solid Figure, contained under several Planes whose Bases are rectangular Parallelograms, parallel and alike situate.

PRIVILEGE, is by Cicero defined to be *Lex private homini irrogata*. Others say it is, *Jus singulare*, whereby a private man, or a particular Corporation, is exempted from the rigour of the Common Law. It is used sometimes in the Common Law, for a place that hath any special Immunity.

PRIVILEGE, is either Personal or Real: A *Personal Privilege*, is that which is granted to any Person either against or beyond the Course of the Common Law: As for Example, A Member of Parliament may not be arrested nor any of his Servants, during the sitting of the Parliament; nor for a certain time before and after. A *Privilege Real*, is that which is granted to a place, as to the *Universities*. That none of either may be called to *Westminster-Hall*, upon any Contract made within their own Precincts, or prosecuted in other Courts. And one belonging to the Court of Chancery cannot be sued in any other Court, certain Cases excepted; and if he be, he may remove it by *Writ of Privilege*.

PRIVY, in Law, signifies him that is partaker, or hath an Interest in any Action or Thing, as *Privy of Blood*, be those that are linked in Consanguinity; every Heir in Tail is *Privy* to recover the Land intailed. The Author of the *New Terms of Law*, maketh divers sorts of *Privies*, viz. *Privies in Estate*, *Privies in Deed*, *Privies in Law*, *Privies in Right*, and *Privies in Blood*. Others mention four kinds of *Privies*, viz. *Privies in Blood*, as the Heir to his Father. *Privies in Representation*, as Executors or Administrators to the deceased. *Privies in Estate*, as he in the Reversion, and he in the Remainder, when Land is given to one for Life, to another in Fee, for that their Estates are created both at one time. The fourth is *Privy in Tenure*, as the Lord by escheat, that is, when the Land escheateth to the Lord for want of Heirs.

PRIVY-SEAL, is a Seal that the King useth to such Grants, or other things, as pass the *Great Seal*; first they pass the *Privy-Signet*, then the *Privy-Seal*; and lastly the *Great-Seal of England*. The *Privy-Seal* is sometimes used in things of less consequence, that never pass the *Great Seal*, no Writs shall pass under the *Privy-Seal*, which touch the Common Law.

PROBATE, of Testaments, is the exhibiting and proving Wills and Testaments before the Ecclesiastical Judge, delegated by the Bishop, who is Ordinary of the Place, when the party dies. And the Ordinary is known by the quantity of Goods that the deceased hath out of the Diocese wherein he departed; for if all his Goods be in the same Diocese, then the Bishop of the Diocese, or the Archdeacon, according as their composition leads, hath the *Probate of the Testament*: But if the Goods be dispersed in divers Diocesses, so that there be any sum of note (as five pounds ordinarily) out of the Diocese where the party lived; then is the

the Archbishop of *Canterbury* the Ordinary by *Prerogative*.

This *Probate* may be made in two sorts, in *Common form* or *per testes*. The proof in common form is only by the Oath of the Executor or Party exhibiting the Will, who sweareth upon his belief, that the Will exhibited by him, is the last Will and Testament of the deceased. The proof *per testes* is when over and besides his own Oath, he also produces Witnesses, or makes other proof to confirm the same, and that in the presence of such as may pretend any interest in the Goods of the deceased, or at least in their absence, after they have been Lawfully summoned to see such a Will proved, if they think good. And the latter course is taken most commonly when there is fear of strife or dispute about the deceased's Goods. For some hold that a Will proved in common form only may be called in question any time within thirty Years after: And where a will disposes of Lands and Tenements of Freehold, it is now frequently proved by Witnesses in *Chancery*.

PROBATOR, in Law signifies an Accuser, or Approver, or one who undertakes to prove a crime charged upon another.

PROBE, a Chirurgical Instrument to sound the Depth and Circumstances of Wounds or Ulcers.

PROBLEM, is a Proposition which relates to Practice; or which proposes something to be done; As to make a Circle pass through three given Points not lying in a Right Line: To find the Compass, &c.

PROCATARCTICA, is the pre-existent Cause of a Disease, which co-operates with others that are subsequent; whether it be external or internal, as Anger, or Heat in the Air, which beget ill Juice in the Blood and cause a Fever. *Blanchard*.

PROCEDENDO, is a Writ whereby a Plea or Cause formerly called from a Base Court to the *Chancery*, *Kings-Bench*, or *Common-Pleas*, by Writ of *Privilege* or *Certiorari*, is released and sent down again to the same Courts to be proceeded in there, after it appeareth that the Defendant hath no cause of *Privilege*, or that the matter comprised in the Bill not well proved.

PROCESSE, in Law, is the manner of proceeding in every Cause, being the Writs and precepts that go forth upon the Original upon every Action, being either Original or Judicial. Sometimes that only is called the *Process*, by which a man is called into the Court, because it is the beginning or principal part thereof, by which the rest of the business is directed. The difference between *Process* and *Precept*, or *Warrant* of the Justices, is this, the *Precept* or *Warrant* is only to attach and convey the party before any Indictment or Conviction, and may be made either in the name of the King or the Justice: But the *Process* is always in the King's Name, and usually after an Indictment.

PROCESS, in Chymistry signifies the whole exact Course of any Operation or Experiment.

PROCESSION, in Cathedral and Conventual Churches, the Members formerly had their stated Processions, wherein they walked two and two in their most Ornamental Habits, with Hymns, Musick and other suitable expressions of Solemnity, and respect to the occasion. In every Parish there was a Customary *Procession* of the Parish Priest, the Patron of the Church with the Chief *Flag*, or

Holy Banner, and the other Parishioners in *Ascension Week*, to take a Circuit round the Limits of the Mannor, and pray for a Blessing on the Fruits of the Earth. To this we owe our present Custom of *Perambulation*, which is still in most places called *Processioning*, and going in Procession, tho' we have lost the Order, and almost the Devotion, as well as the Pomp and Superstition of it.

PROCESSUM continuando, is a Writ for the continuance of a *Process*, after the Death of the Chief Justice, or other Justice in the Writ of *Oyer* and *Terminer*.

PROCESSUS, *vid. Apophysis*.

PROCESSUS Ciliaris. See *Ciliare Ligamentum*.

PROCESSUS Membrillares. See *Papillarum Processus*.

PROCESSUS Peritonæi, are as it were two oblong Pipes, or Channels, one on each side the *Os Pubis*, reaching to the Skin of the *Scrotum*, thro' the Holes of the Tendons of the Oblique and Transverse Muscles, in which Production, or *Didymi*, as the Ancients called them, the Seminary Vessels descend, and bestowing one Tunicle on the *Testes*, they contain them like a Bag. By the Holes of these *Processes*, the Muscles called *Cremasteres* do also descend.

PHROCESSUS Styloformis, or *Styloides*, is a kind of External Process of the *Ossa Temporum*, being small and long, having the Horns of the *Os Hyoides* tyed to it, it is a slender and long Appendix, and in Infants is Cartilaginous, but in Adult Persons, Bony.

PROCESSUS Zygomaticus or *Zugalis*, is an External Process of the *Ossa Temporum*, which runs forward, and is joined with the Bone of the upper Maxilla, from which juncture is formed that Bridge called the *Zygoma*, reaching from the Eye to the Ear, under which lie the Tendons of the *Crotaphite* Muscle.

PROCHEIN amy, in Common Law, signifies him that is next of Kin to a Child in his Nonage, and is in that respect allowed by Law to deal for him, in the managing his Affairs, as to be his Guardian, if he hold any Land in *Socage*, and in Redress of any Wrong done to him, and is in the Prosecution of any Action at Law *per Guardianum*, where the Plaintiff is an Infant, & *per proximum amicum*, where the Infant is Defendant.

PROCIDENTIA Ani, is a falling out of the Lower end of the *Rectum intestinum*, and is very usual in Children.

PROCIDENTIA uteri, is a relaxing of the inner Tunick of the *Vagina* of the Womb, and was cut off by Physicians formerly, and even still, some think the Womb it self may fall down; but the Ligaments are so strong as to hinder any such Fall. *Blanchard*.

PROCLAMATION, is a Notice publicly given of any thing, whereof the King thinks fit to advertise his Subject.

PROCLAMATION of a Fine, is a notice openly and solemnly given at all the Assizes held in the County, within one Year after the engrossing it. And these Proclamations are made upon Transcripts of the Fine, sent by the Justices of the Common-Pleas, to the Justices of Assize, and the Justices of Peace.

PROCLAMATION of Rebellion, is a Publick Notice given by the Officer, That a Man not appearing upon a *Subpena*, nor an Attachment in the Chancery

Chancery, shall be reputed a Rebel, unless he render himself by a Day assign'd in this Writ.

PROCONDYLI are the Bones of the Fingers next the back of the Hand.

PRO confesso, in Law, is when upon a Bill exhibited in Chancery, the Defendant appears, upon a *Habens Corpus* (which is granted by order) to bring him to the Bar, the Court Assigns him a Day to Answer; which being expired, and no Answer put in, a second *Habens Corpus* is granted, and a further Day assign'd; by which Day, if he answer not, the Bill upon the Plaintiff's Motion, shall be taken *pro confesso*, unless cause be shewed by a Day, which the Court usually gives, and for want of such cause shew'd upon Motion, the Substance of the Plaintiff's Bill shall be decreed, as if it had been confessed by the Defendant's Answer.

PROCTOR, is he who undertakes to manage another Man's Cause in any Court of the Civil or Ecclesiastical Law, for his Fee.

PROCTORS of the Clergy, are those who are chosen and appointed to appear for the Cathedral and other Collegiate Churches; as also for the Common Clergy of every Diocess at the Parliament, to sit in the Lower-house of Convocation.

PROCURATORY, is the Instrument by which any Person or Community did constitute or delegate their Proctor or Proctors to represent them in any Judicial Court or Cause.

PRODROMUS Morbus, is a Disease that comes before a greater, as the faintness of the Breast predicts a Consumption, or the Rickets. *Blanchard.*

PRODUCE, a Term in Geometry, signifying to continue a Right Line, or draw it out farther, till it have any assigned Length.

PRODUCT, is the Quantity Arising from, or Produced by the Multiplication of two or more Numbers, Lines, &c. into one another, thus, If 6 be multiplied by 8, the Product in 48. In Lines, 'tis always, (and sometimes in Numbers) called the Rectangle between the two Lines that are multiplyed one by another. See *Rectangle*.

PROEGUMENA, is an Antecedent Internal Cause of a Disease in the Body, occasioned by another, and so causing the Disease, that if it be taken away, the Disease may still continue; as a *Plethora*, or ill Juice in the Blood, produced by an ill way of Diet, whence proceeds an Obstruction of the Entrails. *Blanchard.*

PROFIL (*French*) a Term in Painting, signifying properly a Face or Head set sideways, as usually on Medals, and such a Face is said to be in *Profil*, or in a Side View. 'Tis also spoken of the View of a Building, or City, &c. in Opposition to the Plan or Ground-plot of it; and so appears to have much the same sense as a Prospect of any Place, City, or Piece of Architecture, viewed sideways, and expressed according to the Rules of *Perspective*. This is called the *Profil* of such a Place, City, &c. Some call the Out-lines of any Figure its *Profil*, but that way of speaking is improper.

PROFUNDUS, a Muscle, which bends the Fingers.

PROGNOSIS & Signa Prognostica, are Signs whereby we know what will become of the Patient, as to Recovery or Death.

PROGRESSION *Arithmetical*, or Continual Proportion *Arithmetical*, is when Numbers (or other Quantities) or proceed by equal differences (either increasing or decreasing.) As,

2, 4, 6, 8, 10, 12, 14, &c.
3, 5, 7, 9, 11, 13, 15, &c.
16, 14, 12, 10, 8, 6, 4, &c.

In the two former, is a continual Increase, in the latter a continual Decrease, by two in all of them; which is called the *Common Difference*, or *Common Excess*.

1. If three Quantities are in *Arithmetical Proportion Continued*, the Sum of the *Extremes* is equal to the Double of the *Mean*.

Let a be the first Term, and x the Common Difference; then will the three Quantities be $a, a+x, a+2x$; or $a, a-x, a-2x$, if the Progression descend.

Now $a+x$, doubled, is $= a+a+2x = 2a+2x$. Q. E. D.

2. If four Quantities are so, the Sum of the *Extremes* is equal to the Sum of the *Means*.

Let the four Terms be $a, a+x, a+2x, a+3x$.

'Tis plain, that the Sum of the *Means*, and of the *Extremes*, is $2a+3x$.

3. If never-so many Quantities are so proportional, the Sum of the *Extremes* is always equal to the Double of the *Mean*, if the Number of the Terms be odd, or to the Sum of any two Terms equally distant from the *Extremes*.

Thus, in the following Series,

2 4 6 8 10 12 14
a. $a+x$. $a+2x$. $a+3x$. $a+4x$. $a+5x$. $a+6x$.
16 18 20 22
 $a+7x$. $a+8x$. $a+9x$. $a+10x$.

The Sum of the *Extremes* $2a+10x$ is equal to $a+5x$ multiplied by 2; that is, the Double of the middle Term: As it is also to the Sum of any Two of them equally distant from both *Extremes*.

And this must ever be, because the last Term contains in it the first, and also the common Difference super-added as often as the Number of its Place is distant from the first Term: But the first Term hath no Addition of the Difference at all; and as the second Term hath one Difference or Ratio more than the first, the third one more than the second, &c. so the last save one, hath one less than the last of all; the last save two, one less than the last save one, &c. So that the Sum of any two of these equally distant from the *Extremes*, must be equal to the Sum of the *Extremes*; because one encreases as much as the other decreases.

Hence 'tis plain,

COROLLARIES.

1. That the Sum of any Number of Terms in such a Progression may be had, if the Sum of the *Extremes* be multiplied by half the Number of the Terms, or half that Sum by the whole Number of the Terms.

2. To gain the Sum of never so many Quantities in this *Progression*, there is nothing necessary to be given but the Extremes and the Number of Terms: So that if by having the *First Term* and *Common Excess*, one could get the *Last*, 'twould strangely dispatch Questions in *Progression*.

3. Which last Term in such a *Progression* may be had easily, by multiplying the Number of the Terms, lessened by one, into the Common Excess, and then to that Product adding the first Term.

Thus, if the last Term, in a *Progression* of 52 Places were desired, where the Common Difference is 3, and the first Term 5;

Multiply 51 by 3, it produces 153; to which adding 5 the first Term, you have 158 equal to the last Term in such a *Progression*.

4. Wherefore if the *Progression* begin with a Cypher, (which is the most Natural and Simple *Progression*; for when it begins with any other Term, 'tis in reality a Compound of two *Progressions*; one of Equals; as of $a, a, a, a, \&c.$ and the other of Arithmetical Proportionals, as $o, x, 2x, 3x, 4x, \&c.$) then I say, the Sum of all the Terms will be equal to half the Product of the last Term multiplied by the whole Number of the Terms: For by the First Corollary, the Sum of all the Terms will be equal to the Sum of the Extremes multiplied by half the Number of Terms.

Thus, suppose

$o, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20.$

Or,

$o, x, 2x, 3x, 4x, 5x, 6x, 7x, 8x, 9x, 10x.$

20 the last Term, multiplied by 11 the Number of the Terms, gives 220; the half of which, 110, is the Sum of all the Terms.

For, by *Corollary* the First, 20, the Sum of the Extremes, multiplied by 5, 5 half the Number of Terms, produces 110, the Sum of all the Terms.

5. Hence this very useful Theorem may be deduced, that the Sum of all the Terms in any such *Progression*, beginning from o , is *Subduple* of the Sum of so many Terms, all equal to the greatest. For let the first Term be o , and the last x , and the given Number of the Terms n ; then (by *N^o 1.*) will the Sum of all the Terms of the *Progression* be $\frac{1}{2} n x$, which is half or *subduple* of $n x$ equal to the Number of so many Terms equal to the greatest: Q. E. D.

6. The Sum of a Simple Arithmetical *Progression*, (*i. e.* ascending by the Cardinal Numbers) continued from Unity *ad Infinitum*, is subduple the Sum of the same Number of Terms, each of which is equal to the greatest; or, on the contrary, this latter Sum is double of the former. By prefixing a Cypher before unity, this would be but a Case of the last Corollary, the Sum of the *Progression* remaining still the same.

But that this is true in an infinite Series beginning from Unity, (for in a Finite or Determinate one, the Proportion of the Sum is always less than double; tho' it always approaches to it, and comes

so much the nearer by how much greater the Series is) we shall now thus demonstrate:

To the Sum of Three Terms, 1, 2, 3, *i. e.* 6, the Sum of as many equal in Number to the greatest, *i. e.* 9, has the same Proportion as 3 to 2; but to the Sum of Six Terms, 1, 2, 3, 4, 5, 6, *i. e.* 21, the Sum of as many equal to the greatest, *i. e.* 36, has the same Proportion as 3 to $1 + \frac{1}{2}$ that is 3 to $2 - \frac{1}{2}$, the Decrease being $\frac{1}{2}$; but to the Sum of Twelve Terms, which may be found by *Coroll. 1.* equal 78, the Sum of so many equal to the greatest, *viz* 144, has the same Proportion, (dividing both sides by 48) as 3 to $1 + \frac{1}{3}$ *i. e.* 3 to $1 + \frac{1}{3} + \frac{1}{9}$, (for 24 make $\frac{1}{3}$, and the Remainder $\frac{1}{9}$ is the same as $\frac{1}{9}$) that is, as 3 to $2 - \frac{1}{3} - \frac{1}{9}$, the Decrement being now $\frac{1}{9}$. Since therefore, by doubling the Number of Terms onwards, you'll find the Decrement to be $\frac{1}{2}$, and so onwards in double Proportion; the Sum of an Infinite Number of such Terms, in Arithmetical *Progression*, equal to the greatest, will be to the Sum of the *Progression*, from 1 *ad infinitum*; as 3 to $2 - \frac{1}{2} - \frac{1}{4} - \frac{1}{8}, \&c.$ that is, by *Coroll. 1* and 2, as 3 to $2 - \frac{1}{2}$, that is, as 3 to $1 + \frac{1}{2}$, or as 2 to 1. Q. E. D.

7. The Sum of any Duplicate Arithmetical *Progression*, continued from Unity *ad infinitum*, is subtriple of the Sum of as many Terms equal to the greatest, as is the Number of Terms: For any such Finite *Progression* is greater than the Subtriple Proportion, but approaches nearer and nearer to it continually, but how much the farther the Series of the *Progression* is carried on. Thus the Sum of Three Terms, 1, 4, 9, = 14, is to thrice 9 = 27, as $1 + \frac{1}{2}$ or $1 + \frac{1}{3}$ or $1 + \frac{1}{4} + \frac{1}{5}$ to 3, (dividing both sides by 9) the Sum of Six Terms, 1, 4, 9, 16, 25, 36, *&c. viz.* 91 to Six times 36, *i. e.* to 216, (dividing both sides by 72) is as $1 + \frac{1}{2} + \frac{1}{3}$ to 3, and the Sum of Twelve Terms 650, to 12 times 144, *i. e.* 1728, (dividing both sides by 576) is as $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4}$ to 3, *&c.* the Fraction, adhering to them thus constantly decreasing, some by their Half parts, others by Three quarters: (for $\frac{1}{2}$ is $\frac{1}{2}$; therefore the first Decrement is $\frac{1}{2}$, and $\frac{1}{3}$ is $\frac{1}{3}$; therefore the second Decrement is $\frac{1}{3}$, *&c.*) Wherefore the Sum of the Infinite *Progression* will be to the Sum of the like Number of Terms equal to the greatest; as,

$$\begin{array}{r} 1 + \frac{1}{2} + \frac{1}{3} \\ - \frac{1}{2} - \frac{1}{3} \\ \hline - \frac{1}{3} - \frac{1}{4} \\ \hline - \frac{1}{4} - \frac{1}{5} \\ \hline \end{array}$$

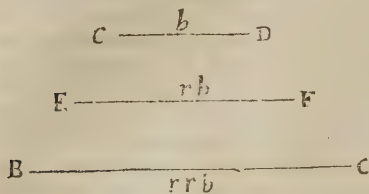
&c. to 3, by *Coroll. 2d* and 4th, in *Progression Geometrical*.

But the Sum of a Triplicate Arithmetical *Progression*, (*i. e.* ascending by the Cubes of the Cardinal Numbers) proceeding from 1 thro' 27, 64, *&c. ad infinitum*, is subquadruple of the like Number of Terms equal to the greatest: For the Sum of Four Terms, 1, 8, 27, 64, *i. e.* 100, to 4 times 64, *i. e.* 256, (dividing both sides by 64) will be found to be as $1 + \frac{1}{2} + \frac{1}{3}$ to 4; but the Sum of 8 Terms, 1, 8, 27, 64, 125, 216, 343, 512, *i. e.* 1296 to 8 times 512, *i. e.* 4096, (dividing both sides by 1024) will be found to be as $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4}$ to 4, *&c.* The adhering Fractions thus constantly decreasing, the one by their Half part, the others by Three quarters, (for $\frac{1}{2}$ is $\frac{1}{2}$ and $\frac{1}{3}$ is $\frac{1}{3}$, *&c.* Wherefore the Sum of the

Inf.

Infinite Progression will be to the Sum of a like (Infinite) Number of Terms, equal to the great-
est; as,

$$1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \frac{1}{64} + \frac{1}{128} + \frac{1}{256} + \frac{1}{512} + \frac{1}{1024} + \frac{1}{2048} + \frac{1}{4096} + \frac{1}{8192} + \frac{1}{16384} + \frac{1}{32768} + \frac{1}{65536} + \frac{1}{131072} + \frac{1}{262144} + \frac{1}{524288} + \frac{1}{1048576} + \frac{1}{2097152} + \frac{1}{4194304} + \frac{1}{8388608} + \frac{1}{16777216} + \frac{1}{33554432} + \frac{1}{67108864} + \frac{1}{134217728} + \frac{1}{268435456} + \frac{1}{536870912} + \frac{1}{1073741824} + \frac{1}{2147483648} + \frac{1}{4294967296} + \frac{1}{8589934592} + \frac{1}{17179869184} + \frac{1}{34359738368} + \frac{1}{68719476736} + \frac{1}{137438953472} + \frac{1}{274877906944} + \frac{1}{549755813888} + \frac{1}{1099511627776} + \frac{1}{2199023255552} + \frac{1}{4398046511104} + \frac{1}{8796093022208} + \frac{1}{17592186044416} + \frac{1}{35184372088832} + \frac{1}{70368744177664} + \frac{1}{140737488355328} + 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\frac{1}{452312848583266388373324160190187140051835877600158453279131187530910662656} + \frac{1}{904625697166532776746648320380374280103671755200316906558262375061821325312} + \frac{1}{1809251394333065553493296640760748560207343510400633813116524750123642650624} + \frac{1}{3618502788666131106986593281521497120414687020801267626233049500247285301248} + \frac{1}{7237005577332262213973186563042994240829374041602535252466099000494570602496} + \frac{1}{14474011154664524427946373126085988481658748083205070504932198000989141204992} + \frac{1}{28948022309329048855892746252171976963317496166410141009864396001978282409984} + \frac{1}{57896044618658097711785492504343953926634992332820282019728792003956564819968} + \frac{1}{115792089237316195423570985008687907853269984665640564039457584007913129639936} + \frac{1}{231584178474632390847141970017375815706539969331281128078915168015826259279872} + \frac{1}{463168356949264781694283940034751631413079938662562256157830336031652518559744} + \frac{1}{926336713898529563388567880069503262826159877325124512315660672063305037119488} + \frac{1}{1852673427797059126777135760139006525652319754650249024631321344126610074238976} + \frac{1}{37053468555941182535542715202780130$$



phery, that is (as before) half $rrab$: The former of which is equal to the Surface of the Given Cone, by the 4th Conf. of his Def. 18.) and the latter to the Area of the Circle, whose Radius is the Mean Proportion E F, (by the 2d Conf. of his Def. 15.) Q. E. D.

And from hence also flows naturally this other Proposition, That the Surface of the Cone, half $rrab$, is to its Base half ab ; as the Side of the Cone rrb , is to the Radius of the Base b . For

$$\frac{1}{2}rrab : \frac{1}{2}ab :: rrb : b.$$

PROPOSITION II.

If four Quantities are proportional, either continually or discretely, the Product of the Extremes is equal to the Product of the Means.

For if a, ra, ra, rra , &c. or 2. 4. 8. 16. &c. 'tis plain the Product of the Extremes and of the Means, is the same Quantity $rrraa$ or 32.

In discreet Proportionals, let $a : ra :: b : rb$; that is, 2 : 4 :: 15 : 30. The Product of the Extremes and of the Means can here be no other than $rab = 60$.

On which Proportion is grounded the Golden Rule, or Rule of Three in Arithmetick; so called, because having Three Numbers, (as 2. 4. 15.) it reaches how to find an unknown Fourth Proportional: For altho' this Fourth be unknown, yet its Product by 2 the First Term is known, because 'tis the same with the Product of the Means 4 and 15. Wherefore the Rule directs us to multiply the Third by the Second, that you may thereby obtain the Product of the Extremes; which divided by one of the Extremes, viz. the First, must needs give the other, that is, the Fourth sought.

COROLLARY.

Hence 'tis plain, That if two Products arising from the Multiplication of any two Pairs of Quantities, are equal; those four Quantities will be at least discretely proportional.

PROPOSITION III.

If there are never so many continual Proportionals, the Product of the Extremes is equal to the Product of any two of the Means that are equally distant from the Extremes, as also to the Square of the Mean or Middle Term, if the Number of the Terms be odd.

Thus in this Progression;

2 4 8 16 32 64 128.
a. ra. ra. rra. rrra. rrrra. &c.

It's plain the Product of the Extremes, and of any two Terms equally distant from them, and the Square of the middle Term, must always be $rraa$.

At the last Term but one, is multiplied into a Degree or Power of the Ratio less by one than the last; so the second Term is multiplied into one more than the first: And therefore the Rectangle of the Extremes must still be the same Quantity with that of the Product of any two Terms equally distant from that; and this also equal to the Square of the Middle Term, if the Number of them be odd.

PROPOSITION IV.

Having the first and last Terms, and the Ratio. To find the Sum of all the Terms in any Geometrical Progression, Mr. Oughtred gives this Method.

Let a be the first Term, and y the last; then let $z - y =$ all the Antecedents, and $z - a =$ all the Consequents. Therefore, by Composition of Proportion, it plainly follows, That $a. ra :: z - y. z - a$. That is, the first Term is to the second :: as the Sum of all the Antecedents is to the Sum of all the Consequents: Wherefore by Multiplication of the Extremes and Means, $za - aa = raz - ray$. Wherefore transfer za , and it will be $-aa = raz - ray - za$. Transpose ray , then will $ray - aa = raz - za$. Divide each Part by $ra - a$, and z will be equal to $\frac{ray - aa}{ra - a}$.

That is, Multiply the second and last Terms together, and from the Product subtract the Square of the first Term; and then divide the Remainder by the Difference between the first and second Term, and the Quotient will be the Sum of all the Terms.

Example, in this Series 2. 4. 8. 16. 32. 64. 128.

		2
		4
128		8
4		16
		32
512		64
4		128
<hr/>		
2) 504	(254 = 254

The z of all the Terms but the last, may be found very easily thus: From the last take the first, and divide the Remainder by the Ratio lessened by Unity; the Quotient is the Sum of all the Terms but the last, as will very easily appear if you multiply and divide Algebraically: Which Rule is in some Cases more ready than the former, and therefore 'tis sometimes referred to in the following Consuetaries, under the Name of Rule 2.

PROPOSITION V.

Having the Ratio of the Terms in any Geometrical Progression, To find any of the other Terms, or to find any Term sought.

As for Instance: In Progression, whose Ratio is 2, to find the 24th Term; or to answer expeditiously the common Question of the Price of an

4 H Horse

Horie sold at a Farthing a Nail (of his Shooe) and doubled every time.

Begin and double, as tis ealie to do, for 6 or 8 times, thus,

0	1	2	3	4	5	6	7	8
1.	2.	4.	8.	16.	32.	64.	128.	256.

And then over the Geometrical Numbers place a Series of Arithmetical ones, beginning with 0, as you see: These are Indexes or Exponents of the other, and shew every where how often the Ratio is multiplied into its self, to produce any particular Term. Thus over 64, the 7th Term, there stands the Index or Exponent 6; which shews that 64 is the 6th Power of the Ratio 2, (since the Series begins with Unity.) Now the Addition and Subtraction of the Indexes answers to the Multiplication and Division of the Numbers they stand over: For $3 + 5 = 8$, which is the Index of 256, the Product of 8 into 32; and $7 - 4 = 3$, which is the Index of 8, the Quotient of 128 divided by 16. This being the admirable Property and vast Use of these Indices, (which is the Reason and Foundation of the whole Business of the *Logarithms*, as you may see under that Word) 'tis very ealie by their help to come at any Term, tho' never so remote either way. For supposing I would have the 16th Place in this Progression, since $8 + 8 = 16$, I find, that if I multiply 256 by it self, or square it, it will give me 65536, which is the 16th place; and since $16 + 7 = 23$, if I multiply that Number by 128, it will produce 8388608, which is the 24th Place or Nail; (for the Indices begin with 0) and therefore that doubled, according to the Condition of the Question, will give 16777216 Farthings, which reduced, is 17476 l. 5 s. 4 d.

From which *Propositions* about Geometrical Proportionals, these wonderful *Corollaries* may be deduced.

1. That 'tis possible by these Rules to collect an Infinite Series of Proportional Terms into one Sum, altho' it is impossible to run over all the Terms separately, because Infinite. Thus, in a continu'd Series of Fractions decreasing in a double Proportion, $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \frac{1}{32}, \text{ \&c. ad infinitum}$, if you take them backwards, you may justly reckon a Cypher, or 0, for the first Term; (for between $\frac{1}{2}$ and 0, there may be an Infinite Number of such Terms) and the Infinite Sum of these Terms will be precisely equal to Unity: For subtracting the first 0 from the last $\frac{1}{2}$, and the Remainder $\frac{1}{2}$ being divided by the Name of the Reason less'n'd by 1, that is by 1, which divides nothing; the Quotient $\frac{1}{2}$ is the Sum of all the Terms, excepting the last, (by Rule 2.) and to the last $\frac{1}{2}$ being added, the Sum of all in that Series will be 1. Now if the last is not $\frac{1}{2}$, but 1, the Sum of all will necessarily be 2; and if 2 be the last, the Sum of all will be 4: In a Word, it will be always double the last Term.

2. And since in this Case the Sum of all the preceding Terms is equal to the last Term, the one being subtracted from the other, there will remain nothing, i. e. $\frac{1}{2} - \frac{1}{2} = 0$; and also, $1 - \frac{1}{2} = \frac{1}{2}$, $\text{ \&c. in infinitum}$, is = 0; and also, $1 - \frac{1}{2} = \frac{1}{2}$, $\text{ \&c. or } 2 - 1 = \frac{1}{2} = \frac{1}{2}$, $\text{ \&c.} = 0$.

3. In like manner the Sum of Infinite Fractions

decreasing in tripple Reason in an Infinite Series, $\frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \frac{1}{81}, \text{ \&c.}$ will be equal to $\frac{1}{2}$: For if from the last $\frac{1}{81}$ (again in an inverted Order) you subtract the first 0, and the Remainder $\frac{1}{81}$ be divided by the Name of the Reason less'n'd by Unity, that is by 2, the Quotient $\frac{1}{162}$ will be the Sum of all the Antecedent Terms; and adding to this last $\frac{1}{81}$ or $\frac{2}{162}$, the Sum of all will be $\frac{1}{81}$ or $\frac{1}{2}$.

But had the Fractions decreas'd from $\frac{1}{4}$ in a Quadruple, or from $\frac{1}{5}$ in a Quintuple Proportion, \&c. the Sum of the whole Series would have been accordingly $\frac{1}{3}$ or $\frac{1}{4}$, and so any Series of this kind is equal to a Fraction, whose Denominator is less by an Unite than the Denominator of the last Fraction in that Series, (supposing the Series to be numbred backward, as before.)

4. Generally also, any Infinite Series of Fractions decreasing according to the Proportion of the Denominator of the last Term, and having a common Numerator less by an Unite than the Denominator of the last Term, (as $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5}, \text{ \&c.}$ or $\frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6}, \text{ \&c.}$ or $\frac{1}{4} + \frac{1}{5} + \frac{1}{6} + \frac{1}{7}, \text{ \&c.}$ is equal to Unity, after the same way as the Series, *Coroll. 1.* which may be comprehended under this kind, and which may be demonstrated in all its particular Cases by the same Method we have hitherto made use of, or also barely subsumed from *Coroll. 3.* For since $\frac{1}{2} + \frac{1}{3} + \frac{1}{4}, \text{ \&c.}$ is equal to $\frac{1}{2}$; $\frac{1}{3} + \frac{1}{4} + \frac{1}{5}, \text{ \&c.}$ will be equal to $\frac{1}{3}$ or 1; and so in the rest.

And particularly the Sum $\frac{1}{27} + \frac{1}{81} + \frac{1}{243}, \text{ \&c.}$ decreasing in a Quadruple Proportion, is equal to $\frac{1}{18}$; and the Sum of $\frac{1}{25} + \frac{1}{125} + \frac{1}{625}, \text{ \&c.}$ is equal to $\frac{1}{12}$; and the Sum of $\frac{1}{24} + \frac{1}{96} + \frac{1}{384}, \text{ \&c.}$ decreasing in an Octuple Proportion, is equal to $\frac{1}{6}$: For subtracting the first Term 0, and dividing the Remainder by the Name of the Ratio less'n'd by Unity, that is by 3, the Quotient $\frac{1}{72}$, gives the Sum of all, except the last.

This therefore (*viz.* $\frac{1}{72}$) being added, the Sum of all will be $\frac{1}{72}$ or $\frac{1}{72}$: In like manner $\frac{1}{72}$ being divided by the Name of the Reason less'n'd by Unity, the Quotient will give $\frac{1}{48}$; and adding the last, the Sum of all will be $\frac{1}{48}$, i. e. $\frac{1}{48}$: So that hence 'tis evident, that $\frac{1}{2} - \frac{1}{2} = 0$, $\frac{1}{3} - \frac{1}{3} = 0$, \&c. or $-\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}, \text{ \&c. in infinitum}$, will be equal to nothing; and $\frac{1}{2} - \frac{1}{4} = \frac{1}{4}$, $-\frac{1}{4} + \frac{1}{4} = 0$.

5. The Sum of an Infinite Progression, whose greatest Term is a Square Number, the others decreasing according to the odd Numbers 1, 3, 5, 7, \&c. is in Subsequalteran Proportion of the Sum of the like Number of equal Terms, i. e. as 2 to 3. For the Sum of three such Terms, as 9, 8, 5. i. e. 22 to thrice 9, i. e. 27, is (dividing both sides by 9) as 2 $\frac{2}{3}$, *viz.* $\frac{2}{3}$ to 3, or $2 + \frac{1}{3} - \frac{1}{3}$ to 3. But the Sum of Six such Terms, 36, 35, 32, 27, 20, 11, i. e. 161, to six times 36, i. e. 216 (dividing both sides by 72) is as $2 + \frac{1}{4} - \frac{1}{4}$, \&c. the adhering Fractions thus always decreasing, some by half, others by three Quarters, as in *Coroll. 7. Progression Arithmetical:* Wherefore the Sum of the Infinite Progression will be to the Sum of the like Number of Terms equal to the greatest, as,

$$2 + \frac{1}{2} - \frac{1}{2} \\ - \frac{1}{4} + \frac{1}{4} \\ - \frac{1}{8} + \frac{1}{8}, \text{ \&c.}$$

to 3; that is, by *Coroll. 2d* and 4th, as 2 to 3. Q. E. D.

PROHI-

PROHIBITIO *de vasso directa parti*, is a Writ Judicial directed to the Tenant, prohibiting from making Wast upon the Land in Controversie, during the Suit. It is sometimes made to the Sheriff.

PROHIBITION, is a Writ to forbid any Court, either Spiritual or Secular, to proceed in any Cause there depending, upon Suggestion that the Cognisance thereof belongeth not to the same Court: But is now most usually taken for that Writ which lieth for one that is impleaded in the Court Christian, for a Cause belonging to the Temporal Jurisdiction, or the Conisance of the King's Court; whereby as well the Party and his Council, as the Judge himself, and the Register, are forbidden to proceed any further in that Cause.

PROJECTILES, are such Bodies, as being put into a violent Motion by any great Force, are then cast off or let go from the Place where they received their Quantity of Motion, and do afterwards move at a Distance from it; as a Stone thrown out of ones Hand, or by a Sling, an Arrow from a Bow, a Bullet from a Gun, &c.

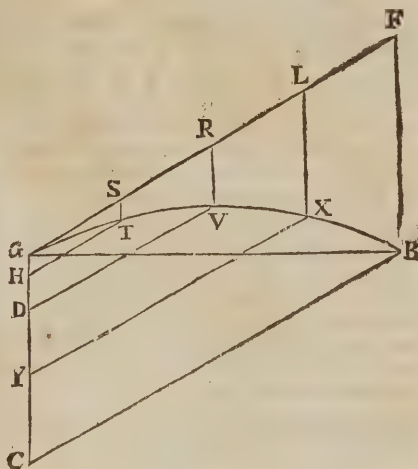
There hath been a great Dispute about the Cause of the Continuation of the Motion of *Projectiles*, or what it is that makes them move after they part from the Force that began the Motion. The *Peripateticks* will needs have it, That the Air being by the Motion of the Hand of the Slinger, &c. put into a most violent Agitation, and forced rapidly to follow the Motion of the Stone, while 'tis accelerated in the Hand of the Slinger, doth to prevent a *Vacuum*, press with all due Velocity after the Stone when it parts from the Hand, and thrusts it forwards as long as it can. But this Account seems very unconceivable; and there needs nothing more to solve the Motion of *Projected Bodies*, but only to consider, That all Bodies being indifferent to Motion or Rest, will necessarily continue the State which they are put into, unless they are forced to change if by some other Force impressed upon them. Thus if a Body be at rest, so it will eternally abide, if nothing move it; or if it be in Motion, so it will eternally move uniformly on in the same right Line, if nothing stop it. Wherefore, when a Stone is put into any Degree of Motion, by the Rotation of the Arm of the Man that slings it, whatever Degree of Velocity it had acquired when it parted from the Hand, the same would it ever after keep if it moved in *Vacuo*, and had no Gravity: But because it hath a Tendency, as all Bodies (by the Law of Nature) have, towards the Centre of the Earth, and is also resisted by the Air all along as it goes, in proportion to its Velocity; it plainly follows, that it must needs be both continually drawn downwards, and also continually retarded in its Progressive Motion forwards, and consequently at last fall down to the Earth, and stop.

The Line of Motion which a Body *projected* describes in the Air, (abstracting from the Resistance of the Medium) is, as hath been proved by *Gallileus*, and many Others, and particularly by our Sir *Isaac Newton*, *Prop. 4. Cor. 1.* of his Second Book, the Curve of a Parabola: Which Line is also described by every Descending Body.

He shews also, That if the Line of Direction of the Projectile Motion of any Body, the Degree of its Velocity, and at the Beginning, the Resistance of the Medium being given, the Curve which it will describe may be discovered, and *vice versa*; he saith also in *Schol. Prop. X. Lib. 2.* That the

Line which a *Projectile* describes in a Medium uniformly resisting the Motion, rather approaches to an *Hyperbola* than a *Parabola*.

The Learned Capt. *Halley* proves all *Projectiles* to describe a *Parabola* thus:



Let the Line *G R F* be the Line in which the *Project* is directed, and in which, by the first *Axiom*, under the Word *Descent*, it would move equal Spaces in equal Times, were it not deflected downwards by the Force of *Gravity*. Let *GB* be the *Horizontal Line*, and *GC* a *Perpendicular* thereto. Then the Line *G R F* being divided into equal Parts, answering to equal Spaces of Time; let the *Descents* of the *Project* be laid down in *Lines* parallel to *GC*, proportioned as the Squares of the Lines, *GS, GR, GL, GF*, or as the Squares of the Times; (*i. e.*) let them be drawn from *S* to *T*, from *R* to *U*, from *L* to *X*, and from *F* to *B*, and draw the Lines *TH, VD, XY, BC*, parallel to *GF*; I say, the Points *T, V, X, B*, are Points in the Curve described by the *Project*, and that That Curve is a *Parabola*.

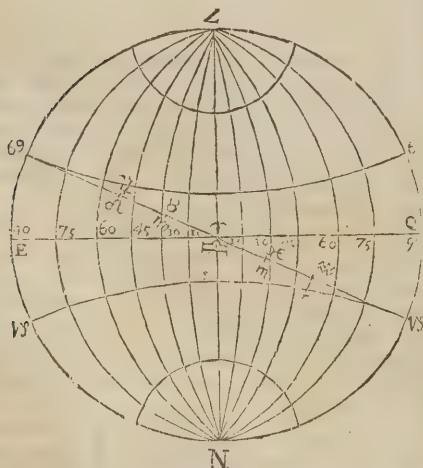
That the Points are in the Curve, is evident by *Axiom 2.* under the Word *Descent* of *Heavy Bodies*: and the Parts of the *Descent* *GH, GD, GY, GC = ST, RV, LX, FB*, being as the Squares of the Times, (by *Prop. 2.* under the Word *Descent*) that is as the Square of the *Ordinates* *HT, DV, YX, BC = GS, GR, GL, GF*, the Spaces measured in those Times; and there being no other Curve but the *Parabola*, whose Parts of the Diameter are as the Squares of the *Ordinates*, it follows that the Curve described by a *Project* can be no other than a *Parabola*: And saying, as *RV* the *Descent* in any Time; as *RG* or *VD* the direct Motion in the same Time; so is *VD* to a Third Proportional, or the *Parameter* of the *Parabola* to the Diameter *GC*, which is always the same in *Project*s cast with the same Velocity: And the Velocity being defined by the Number of Feet moved in a Second of Time, the *Parameter* will be found, by dividing the Square of the Velocity by 16 Foot 1 Inch, the Fall of a Body in the same Time.

PROJECTION, in Chymistry, is putting any Matter to be calcined or fulminated into the Crucible Spoonful by Spoonful. The pretended Casting of the Powder of the Philosopher's Stone into a Crucible of melted Metal, in order (as they boast they can do) to transmute it into Gold or Silver, is called also *Projection*; and the Matter they cast in, the *Powder of Projection*.

PROJECTION of the Sphere in Plano, is a true Geometrical Delineation, of the Circles of the Sphere, or any assigned Parts of them, upon the Plane of some one Circle; as on the *Horizon*, *Meridian*, *Equator*, *Tropick*, &c. And this is either *Stereographick*, which supposes the Eye to be but 90 Degrees distant from, and perpendicular to the Plane of the Projection; or *Orthographick*; when the Eye is at an Infinite Distance.

By what hath been taught in our Doctrine of *Spherical Geometry*, (see that Word) it will be very easie to project the Sphere on any Plane. For the *Analemma*, see that Word. And here follows an Example of the *Stereographick Projection* of the Sphere on the Plane of the *Meridian*, *Equinoctial*, and *Horizon*, which gives good Light into the Knowledge of *Spherical Triangles*, the Doctrine of the Sphere, *Dialing*, &c.

The Stereographick Projection on the Plane of the Meridian.



Let ZQNE be the Meridian.

Z and N the Poles, as also the Zenith and Nadir.

EQ the Equinoctial and Horizon.

ZN the Equinoctial Colure, and Prime Vertical Circle.

Z 15 N, Z 30 N, Z 45 N, &c. are Hour-Circles or Meridians, and also Azimuths, because the Pole is in the Zenith.

And to describe these Circles, find the Points 15, 30, 45, 60, &c. in the Equinoctial, by setting the Half Tangent of their Distance from V; and then their Centres are found by setting their Co-secants both ways from their Points of Intersection with the Equator.

Q, S, and W, W, are the Northern and Sou-

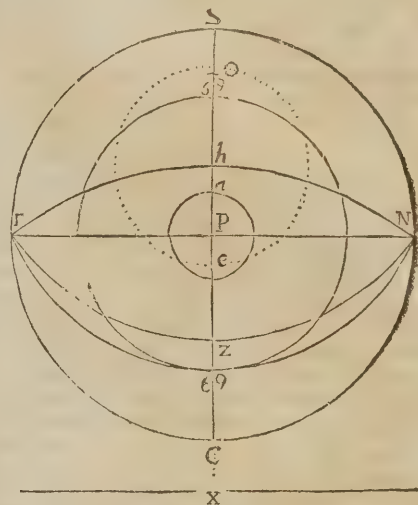
thern Tropicks, which are described by setting the Half Tangent of 23 Deg. 30 Min. from V each way: Then the Tangent of its Complement, viz. 66 Deg. 30 Min. each way from thence on the Colure produced, gives their Centres. By this Method all Parallels, of Declinations may be drawn.

Or you might have set the Co-secant of the Parallel from the Centre of the Primitive, which would have also found the same Point for the Centre of the Parallel, whose Radius is equal to the Tangent of its Distance from its Pole, by Cor. 1. and 2. of Probl. 2. of Spherick Geometry.

These Parallels in this Projection, are also Almucanters, or Parallels of Altitude.

S, W, is the Ecliptick, which must be divided from the Division on the Scale of Half Tangents, but denominated according to the Signs of the Zodiac, reckoning 30 Degrees to each Sign.

The Stereographick Projection on the Plane of the Equinoctial.



Let SC be the Meridian and Solstitial Colure, EN the Equinoctial Colure and Hour-Circle of 6.

P the North Pole.

S S the Northern Tropick.

E S N the Northern Half of the Ecliptick, (whose Centre is found by setting off the Secant of 23 Deg. 30 Min. from S) And its Pole is at a the Intersection of the Polar Circle and Meridian; and is the Place through which all Circles of Longitude must pass.

E Z N the Horizon of London, which is described thus: Set the Half Tangent of the Co-latitude from P to Z; then the Tangent of the same, set from P to O, or its Secant from Z to O, gives its Centre; and its Pole will be at b, 38 Deg. 30 Min. (in the Half Tangents) distant from F, where b is at the Zenith.

To draw any other Circles in this Projection.

1. For Circles of Longitude, which must all pass thro' *a*, and the several Degrees of the *Ecliptick*; set therefore the Tangent of 66 Deg. 30 Min. from *a*, downwards, on the Meridian, produced; which will find a Point, through which a Perpendicular drawn to the Meridian, shall contain in it the Centres of all the Circles of Longitude, whose Distances set off to the Radius *P x*, shall be the Tangents of the Degrees of their Distances from the Meridian, *S P C*, (which is that belonging to 180. Deg.)

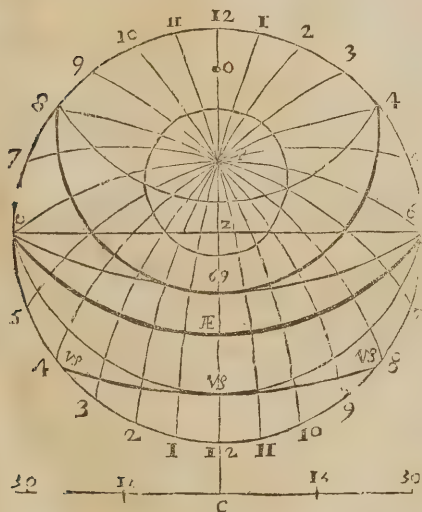
2. All Parallels of Declination are drawn by setting the Half-Tangents of their Distances from *P*.

3. All Azimuths, or Vertical Circles, must pass thro' *b* at the Zenith; Since therefore the Zenith is 38 Deg. 30 Min. distant from *P*, set the Co-secant of that (or the Secant of 51 Deg. 30 Min.) from *b* on the Meridian extended below, and that shall find the Point *x*, the Centre of the Azimuth of East and West, viz, *E b N*; and the Centres of all the rest are in a Line that's perpendicular to the Meridian, and drawn through *x*.

4. Circles of Altitude, or Almicanter are lesser Circles, whose Poles are not in the Plane of the Projection, and may be described by our Third Case of Probl. 9. of Spherick Geometry. Thus the Circle *O e* is a Parallel of Altitude 50 Degrees above the Horizon.

5. All Hour-Circles are straight Lines from the Centre to the Limb.

The Stereographic Projection on the Plane of the Horizon.



First, Draw a Circle representing the Horizon, and quarter it with two Diameters.

Then will

z be the Zenith of the Place.

12 z 12 the Meridian.

6 z 6 the Prime Vertical, or Azimuth of E, & W.

Make

$z P = \frac{1}{2}$ Tangent of 38° 30' (or Tangent of 19° 15')

P shall be the Pole of the World.

Make

$z A = \frac{1}{2}$ Tangent of 51° 30' (or Tangent of 25° 45')

And

$A e = \text{Secant}$ } of 38 Deg. 30 Min.
 $z o = \text{Tang.}$ }

Then shall

o be the Centre of the Equinoctial, 6 *A* 6.

In this Projection, Almicanter are all parallel to the Primitive Circle.

And Azimuths are all Right Lines, passing thro' (z) the Centre of the Primitive, to the equal Divisions in the Limb.

Parallels of Declination, are all Lesser Circles, and parallel to the Equinoctial; and their Intersection with the meridian are found by setting the Half Tangent of their Distance from the Zenith Southward and Northward, or both ways from z .

Their Centres are found by bisecting the Distance between those two Points; for the Middle shall be the Centre of the Parallel.

Thus,

$z S = \frac{1}{2}$ Tangt. of 28° 00' = Distance of the Tropick of S from the Zenith, Southward
And
 $z W = \frac{1}{2}$ Tangt. of 75° 00' = Distance of the Tropick of W from the Zenith, Northward

And the Intersection again with the North of the Meridian, is at

105° 30' } for $z W$ to the Northwards, or upwards from z .
152° 0' }

For the Hour-Circles,

Make $z e = \text{Tangent of } 51^\circ 30'$, or $P o = \text{Secant of } 51^\circ 30'$. Draw *G C T* perpendicular to the produced Meridian. Wherefore, if from *c*, with the Radius $z c$, you set off the Tangents of 15°, 30°, 45°, &c. both ways, you'll have the Centres of the several Hour Circles, 7 and 5, 8 and 4, &c.

Note, In all Stereographic Projections, all Diameters are measured on the Scale of Half Tangents: The Reason of which you have in Prop. 2. of our Spherick Projection. And this is the Ground of all Dyalling, or the True Projection of the Hour-Circles of the Sphere on any Given Plane.

PROJECTURE, a Term in Architecture signifying the Jutting or Leaning-out of any Part of a Building, the Copping of a Wall, &c. These the Italians call *Sporti*, and the Greeks, *Echphoras*; and in the General, all Margents which hang over beyond

yond the *Scapus* of a Column, are called *Projections*.

PRO in Diviso, is a Possession or Occupation of Lands or Tenements, belonging to two or more Persons, whereof none knows his several Portion, as *Co-parceners* before Partition.

PROLABIA, the utmost prominent Parts of the Lips.

PROLEPSIS, is a Figure in Rhetorick, by which we prevent what might be objected by the Adversary.

PROLAPSUS Uteri. See *Uteri Prolapsus*.

PROLEPTICUS, is a Disease always anticipating; so as if the Age came to day at Four of the Clock, then to Morrow one Hour sooner, and so on. *Blanchard*.

PROLOCUTOR of the Convocation House, is an Officer chosen by Persons Ecclesiastical, publicly assembled by Virtue of the King's Writ, for every Parliament: And as there be two Houses of Convocation, so there are two *Prolocutors*, one of the Lower, and one of the Higher House. He of the Lower House, presently upon the first Assembly, by the Motion of the Bishops, being chosen by the Members of the said Lower House, is presented to the Bishops for *Prolocutor*, that is, the Person by whom they intend to deliver their Resolutions to the Higher House, and to have their own House especially ordered and governed. His Office is to cause the Clerk to call the Names of such as are of that House, when he sees Cause to read all things propounded, gather Suffrages, and the like.

PROMOTERS, or *Promoters*, are those who in Popular and Penal Actions do prosecute Offenders in their own Name and the King's; having Part of the Fines or Penalties for their Reward. They do belong especially to the *Exchequer* and *King's Bench*.

PROMULGE a Law, is first to make a Law, and then to declare, publish, and proclaim the same to Publick View; and so *Promulgated*.

PRONOS, or *Pronaus*, a Term used by Architects for a Church-Porch, or a *Portico* to a Palace, great Hall, or spacious Building.

PRONATOR Radii Quadratus, is a Muscle of the *Radius*, which ariseth broad and fleshy from the Lower and Inner part of the *Ulna*; and passing transversely over the Ligament that joins the *Radius* to the *Ulna*, and is so inserted to the Superior and External part of the *Radius*: It helps with the *Pronator Teres* to move the *Radius* inwardly.

PRONATOR Radii Teres is a Muscle of the *Radius*, by some called *Pronator Superior Rotundus*: It ariseth fleshy from the Internal Exuberance of the *Os Humeri*, where those bending the *Carpus* and Fingers do arise; and firmly adhering to the *Flexor Carpi Radialis*, it descends obliquely downwards to its fleshy Insertion, a little above the middle of the *Radius* Externally: Its Use is to move the *Radius* inwards.

PRONOTARY, or *Protonotary*, is a Chief Officer of the *Common Pleas* and *King's Bench*. He of the *King's Bench* records all Actions Civil sued in that Court, as the Clerk of the *Crown-Office* doth all Criminal Causes. Those of the *Common Pleas* do enter and enrol all manner of Declarations, Pleadings, Affidavits, Judgments and Actions: Also they make out all Judicial Writs, as the *Venire facias*, after Issue joined; and *Habeas Corpus*, for bringing in of the Jury; and *Distingas Furator*. They

also make out Writs of Execution and Seisin; Writs of *Superfedeas*, for Appearance to *Exigents*: as well as the *Exigents* and *Writ of Privilege*, for removing Causes from other Inferior Courts of Record, where the Party hath Cause of Privilege; Also Writs of *Procedendo* and *Scire facias* in all Cases, and Writs to enquire of Damages, and all Process upon Prohibitions, and upon Writs of *Audita Querela*, and *Falsè Judgment*; with many other. Lastly, They enrol all Recognizances acknowledged in that Court, and all Common Recoveries; and they make Exemplifications of any Record in the same Term, before their Rolls are made up and delivered into the Treasury of the Records of that Court.

PRONOUN, in Grammar, is a Variable Word, often used as a Noun, and nearly of a like Signification with it: And these *Pronouns* they divide into such as are,

1. *Finite*; as, *I, Thou, He*, &c.
2. *Infinite*; as *Quis, Cujus*, &c.
3. *Demonstrative*, which shew a present Person or Thing; as, *I, You, He*. &c.
4. *Relative*, which refer to some Antecedent Word; as, *who, which*, &c.
5. *Interrogative*; as when *who* and *which*, &c. are used in asking Questions.
6. *Possessives*; as, *Mine, Thine*, &c.
7. *Gentiles*, which express a Nation or Country; as, *Nostros, Vestros, Cujas* in the Latin Tongue.

PRO Partibus Liberandis, is a Writ for the Partition of Lands between Co-heirs.

PROPER Fraction, is such an one as hath its Numerator less than the Denominator; as $\frac{1}{2}$, which is really less than Unity, and therefore properly speaking, a Fraction.

PROPER Navigation, is the guiding of a Ship to any Port desired, where the Voyage is to be performed in the vast Ocean; and requires not only the Lead-Line, and Ordinary compass, but *Azimuth Compass*, *Charts*, *Log-board*, and *Half Minute Glass*; with Instruments for Celestial Observation, as the *Quadrant*, *Fore-staff*, &c. And the Navigator must be able by these to find at any time in what Place the Ship is; which is done by comparing it with any known Place; that is, how much the same known Place is situate from the Ship, either towards the North or South, which is called the *Difference of Latitude*; or towards the East or West, which if in proper Degrees, is called the *Difference of Longitude*.

PROPERTY, or *Propriety*, strictly speaking, is the highest Right that a Man hath or can have to any thing, and no ways depending upon any other Man's Courtship: And this, none in our Kingdom can be said to have in any Lands or Tenements, but only the King in the Right of his Crown; because all the Land throughout the Realm is in the Nature of Fee, and held either mediately or immediately of the Crown.

This Word nevertheless, is used for that Right in Lands and Tenements that Common Persons have, because it importeth as much as *utile Dominium*, tho' not *Directum*. And there are Three manners of Rights of *Property*, that is, *Property Absolute*, *Property Qualified*, and *Property Possessory*.

PROPHASIS, is a Fore knowledge in Diseases, also an Occasion or Antecedent Cause. *Blanchard*.

PRO-

PROPHYLATICA, is a Part of that Part of Physick called *Hygicina*, (or what respects the Preservation of Health) which gives notice of future but imminent Diseases. *Blanchard*.

PROPLASM, the same with a Mould in which any Metal or soft Matter, which afterwards will harden, is cast.

PROPORCITAS, in Law, signifies the Declaration or Deliverance of an Assise; otherwise called *Verdictum Assise*, the Verdict of an Assise; because the Assisors are sworn to declare the Truth, and therefore are called *Juratores* or *Jurors*.

PROPORTION, 1. When two Quantities are compar'd one with another, in respect of their Greatness or Smallness, that Comparison is called *Ratio*, *Reason*, *Rate*, or *Proportion*: But when more than two Quantities are compared, then the Comparison is more usually called the *Proportion* that they have to one another. The Words *Ratio* and *Proportion* are frequently used promiscuously.

2. When two Quantities only are compared, the former Term is called the *Antecedent*, and the latter the *Consequent*.

3. And the *Proportion* or Relation of two Numbers one to another, is found by dividing the *Antecedent* by the *Consequent*; and the Quotient is the Exponent or Denominator of the *Proportion*.

As, if the Quotient be 2, the *Proportion* is Double; if 3, Treble; if 4, Quadruple; if $\frac{1}{2}$, Subduple, or one Half; if $\frac{1}{3}$, Subtriple, or one Third part; if $\frac{1}{4}$, or $\frac{1}{2}$, Sesquilateral, or the *Proportion* denominated by one and an Half; if $\frac{2}{3}$, or $\frac{1}{2}$, Sesquitercian, or once with a Third part; and universally, the *Proportion* of A to B, is that denomi-

nated by $\frac{A}{B}$, that is by the Quotient of A divided by B.

4. These *Proportions*. so many of them as are Rational, or between Number and Number, have particular Names given them by *Greek* and *Latin* Writers.

If after the *Antecedent* be divided by the *Consequent*, the Quotient be 1, it is called *Proportion of Equality*, or *Simple Proportion*.

If the Quotient be 2, 3, 4, (or such other Integer Number) it is called *Multiple Proportion*, (viz. Double, Treble, Quadruple, &c.) And the Contrary to those are called *Submultiple*, (viz. Subduple, Subtriple, Subquadruple, &c.) or One half, a Third part, Fourth part, or such other *Aliquot* Part.

If the Quotient be $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, &c. it is called *Superparticular*, (viz. Sesquilateral, Sesquitercian, Sesquiquartan, &c.) And the Contraries hereunto are called *Subsuperparticular*, (viz. Subsesquilateral, Subsesquitercian, &c.)

If such Quotient be 2, 3, 4, (or such other Integer greater than Unity) with such an *Aliquot* Part, it is called *Multiple-superparticular*, (as $2\frac{1}{2}$, Duple-sesquilateral; $3\frac{1}{3}$, Triple-sesquitercian; $4\frac{1}{4}$, Triple-sesquiquartan, &c.) And the Contraries thereunto are *Submultiple-superparticular*, as *Subduple-sesquilateral*, *Subtriple-sesquitercian*, &c.

If the Quotient be 1, with some Number of *Aliquot* Parts, as $1\frac{1}{2}$, $1\frac{1}{3}$, $1\frac{1}{4}$, &c. it is called *Superpartient*, (as *Superbipartient tertias*, *Supertripartient quartas*, *Superbipartient quintas*, &c.) And the Contraries hereunto are *Subsuperpartient*, as *Subsuperbipartient tertias*, &c.

If such Quotient be some greater Integer Number, (as 2, 3, &c.) with such Number of *Aliquot* Parts, as $2\frac{1}{2}$, $3\frac{1}{3}$, $3\frac{1}{4}$, &c. it is called *Multiple-superpartient*, (as *Duple-superbipartient tertias*, *Tripla-supertripartient quartas*, *Tripla-superbipartient quintas*, &c.) And the Contraries thereunto, *Submultiple-superpartient*, (as *Subduple-superbipartient tertias*, *Subtriple-supertripartient quartas*, &c.) As that of 31 to 7 , (because $\frac{31}{7} = 4\frac{3}{7}$) is *Quadruple-supertripartient septimas*; and its Contrary, 7 to 31 , is *Subquadruple-supertripartient septimas*.

And under some of these Compellations all Proportions will fall, which are as one Integer Number to another.

But notwithstanding all this add, (tho' that the Ancient Geometers may be understood, I thought fit to explain these long, barbarous, and hard Words here) tis much better, and more Intelligible, to express these Proportions, as the usual manner now is, by the Numbers themselves, than by these Names; and briefly and clearly to say, as 31 is to 7 , or as 7 is to 31 , rather than to say *Quadruple-supertripartient septimas*, or *Subquadruple-supertripartient septimas*.

5. If when Four Quantities are considered, you find that the First hath as much Greatness or Smallness, in respect of the Second, as the Third hath in respect of the Fourth: Those Four Quantities are called *Proportionals*, and are thus expressed,

$$8 : 2 :: 16 : 4.$$

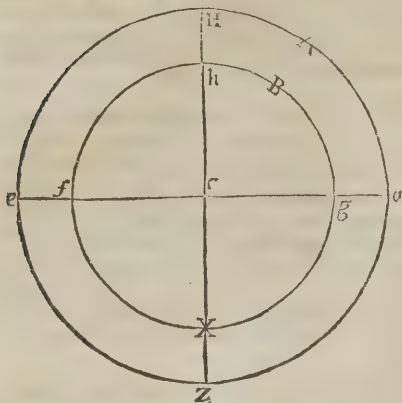
$$a : b :: c : d.$$

That is, As 8 contains 2 four times, so 16 contains 4 four times; and therefore 8 is just as big in respect of 2, as 16 is in respect of 4.

Here therefore, the *Ratio* between the First Pair, is equal to the *Ratio* between the other Pair of Numbers; and consequently, these Four having equal *Ratios*, are *Proportionals*.

But if you encrease or diminish any one of these Four Numbers, the *Ratio* will grow unequal, and then they will not be *Proportionals*: As if instead of 8 you should put 9 or 7, letting all the rest remain as they were; 'twill then be plain, that 9 hath more Magnitude, and 7 hath less in respect of 2, than 16 hath in respect of 4; for 9 contains 2 above four times, and 7 doth not contain it so often as four times; whereas 16 contains 4 exactly four times: Wherefore these latter Numbers, 9, 2, 16, 4, or 7, 2, 16, 4, are not *Proportionals*: And 'twould be the same, if any other Member of the first Four Numbers had been altered; for the *Proportion* would necessarily be destroyed.

6. The annexed Figure will serve very well to explain *Proportion*.



Let the Radius cC be suppos'd to move quite round on its Centre C , 'till the Point c come to the same Place it was at before it began to move; then will that Point c have described the Circumference of a Circle, which let be $HdZe$. Then at the same time, any other Point of the Radius, as suppose f , will also have described the Inner Circle $fbgX$. Draw the two Diameters HZ , and ed , cutting each other at Right Angles in C , which will divide both Circles into four Quadrants. 'Tis plain from hence, that the same Proportion which the outer Circle (Z) bears to its fourth (or any other) part A ; the same must the inner Circle (X) bear to B ; the same Part of its Circumference. For when the longer Radius cC hath moved over the fourth part of the Circle Z , and the Point c is come to H ; then will the Point f also be come to h , and will have gone over a Quadrant of its Circle X ; and when c is come to d , f also will be come to g , and will as well as the other have described a Semi-circle: So that as the Circle Z is to any Part of its Periphery, or as it is to the Ark A ; so will the Circle X be to a like Part of its Periphery, or to the Ark B . That is,

$$\begin{array}{cccc} 12 & 3 & 8 & 2 \\ Z : A :: X : B. \end{array}$$

7. And from these Considerations may all the several Species of Proportion be demonstrated from the Nature of the Thing. For if

$$\begin{array}{cccc} 12 & 3 & 8 & 2 \\ Z : A :: X : B. \end{array}$$

It will certainly follow by *Inversion*, that

$$A : Z :: B : X.$$

That is, If Z be, as big in respect of A , as X is in respect of B ; then must A be as little in respect of Z , as B is in respect of X .

Or if 12 contain 3 as often as 8 contains 2, then will 3 be contained in 12 as oft as 2 is contained in 8.

8. Since $Z : A :: X : B$, it will follow, by *Alternate Proportion*, that $Z : X :: A : B$; that is, Antecedent is to Antecedent, as Consequent is to Consequent: Which is plain, if the former Figure be well considered.

For suppose the outer Circle Z to be Double, Triple, Quadruple, &c. of the inner Circle X ; then must the Ark A (or any other Part of it) be Double, Triple, &c. of the Ark B , a like Part of the Circle X . Therefore, as the Whole is to the Whole, so the Parts must be to the Parts; that is, $Z : X :: A : B$. $Q. E. D.$

9. If you compare the *Differences* (which is what remains when one is subtracted from the other) between the Antecedents and their Consequents, with those Consequents; another Species of *Proportion* will be found, which is called *Proportion by Division*, and ought to be thus express'd,

$$Z - A : A :: X - B : B.$$

Now undoubtedly, if from the whole Circle Z you take a Quarter, (or any other Part) as A ; and also from the whole Circle X you take a Quarter, or any like Part, as B ; the remaining three Quarters of the outer Circle, must be to its other Quarter A , as the remaining three Quarters in the inner Circle are to its Quarter B . That is,

$$\begin{array}{cccc} Z - A : A :: X - B : B. & Q. E. D. \\ 9 : 3 :: 6 : 2 \end{array}$$

10. Or if you add the Antecedents and Consequents together, and then compare the Sums with the former Consequents; another Species arises, called *Proportion by Composition*; and 'tis thus express'd,

$$Z + A : A :: X + B : B.$$

And 'tis certain, since $Z : A :: X : B$, by the Supposition, and also $Z : X :: A : B$. by *Alternate Proportion*: Z and A together will be to A , as X and B together are to B . That is,

$$\begin{array}{cccc} Z + A : A :: X + B : B. & Q. E. D. \\ 15 : 3 :: 10 : 2 \end{array}$$

11. If you compare the Antecedents with the Differences between them and their Consequents, another Species of *Proportion* arises, which is called *Conversion of Proportion*: And is thus express'd,

$$\begin{array}{cccc} 12 : 9 :: 8 : 6 \\ Z.Z - A :: X.X - B \end{array}$$

Which is very plain from the Consideration of the Figure; for no doubt the whole Circle Z is to its $\frac{3}{4}$ (*viz.* $Z - A$) as the whole lesser Circle X is to its $\frac{3}{4}$ (which is $X - B$.)

12. If when $Z : A :: X : B$, you compare the Consequents A and B with two other Quantities, so as to make two Rows of Proportionals, standing thus, $Z : A :: X : B$
 $A : d :: B : I$

Then will Z be to d as X to I , which is another Species of *Proportion by Equality*, or *ex aequo ordinata*: And follows from this Figure very plainly,

plainly, for no doubt the whole Circle Z is to its $\frac{3}{2}$, which is 9 or $d ::$ as the whole Circle X is to its, which is 6 or b .

13. IF Z be taken as often as X, *ex. gr.* 3 Z and 3 X, you may conclude, That $Z : X :: 3 Z : 3 X$, or as 10 Z to 10 X; or also as $12 \frac{1}{2} Z$, to $12 \frac{1}{2} X$. And so on, in whatsoever Proportion the two Magnitudes Z and X are multiplied, so they are multiplied equally, or that you take one as often as you take the other. For then there will be the same Proportion between the Magnitudes thus equally multiplied, as there was between the Simple Magnitudes, before such Multiplications.

And these Magnitudes thus equally multiplied, are called *Equi-multiples* of the simple Magnitudes Z and X: Hence we say, that *Equi-multiples* are in the same Proportion as such simple Magnitudes, out of which they are compounded.

14. IF Z be divided in the same manner as X is; and *ex. gr.* you take a fourth Part of Z, and the like of X; or the tenth, or any other Part of Z, and the same of X: Then will these Parts be proportional to their Wholes, $Z : X :: \frac{1}{4} Z$ (or $\frac{1}{10} Z$) $:\frac{1}{4} X$ (or $\frac{1}{10} X$). All which is self-evident.

15. A Proportion is said to be *Compounded* of other Proportions, when the Exponent of That is made by the Multiplication of the Exponents of These, one into another. Thus, the *Compound of the Treble and Double*, (whose Exponents are 3 and 2) is the *Treble of the Double*, (whose Exponent is 3×2) that is, the *Sextuple* (because $3 \times 2 = 6$) which is manifestly a Work of Multiplication.

16. The *Products*, or the *Quotients* of any Two Quantities or Numbers *Multiplicated* or *Divided* by the same Third Numbers, are in the same Proportion as the Numbers were before they were *Multiplicated* or *Divided*.

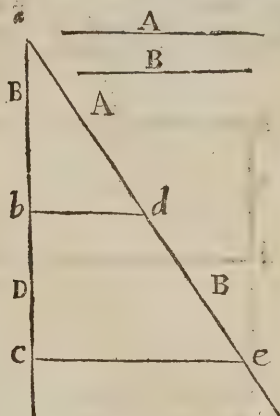
E. gr. 1. Let 8 and 12 be multiplied by 4; then will $8 : 12 :: 32 : 48$.

2. Let 8 and 12 be divided by 4; then will $8 : 12 :: 2 : 3$.

The Reason of which is very plain; because one Number is just as much increased by Multiplication, or diminished by Division, as the other is.

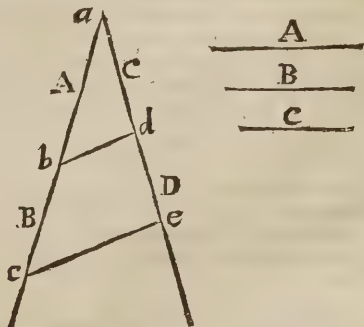
PROBLEMS.

To Two Lines A and B, to find D a Third Proportional.



Make any Right-lined Angle, as $\angle a e e$. Then set off in it $a d = A$, and $a b = B$. Set off also B again from d to e ; then join b and d , and to $b d$, draw a Parallel thro' the Point e , so shall $b c$ be the Line sought for, $A : B :: B : D$, by 2 e 6 *Euclid*.

To Three given Lines, A B and C, to find a Fourth Proportional D.



Make any Angle, as $\angle a c e$; then from a , take $a b = A$, and $b c = B$, and $a d = C$, join $b d$, and thro' c draw a Parallel to $b d$; so shall $d e$ be the Line sought: For $A : B :: C : D$. 2 e 6 *Euclid*.

Of the Proportion of Figures.

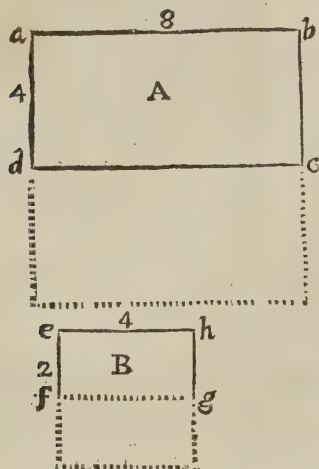
1. To find the Proportion that one Rectangle hath to another, both Length and Breadth must be considered.

For Rectangles are to each other as the Products of their respective Lengths multiplied by their Breadths.

Thus, if there be two Rectangles, the former of which hath its Length 5 Inches, Yards, &c. and its Breadth 3 Inches, Yards, &c. and the latter had its Length 8 Inches, Yards, &c. and its Breadth 4 Inches, Yards, &c. Then the Rectangles will be to each other, as $3 \times 5 (= 15)$ is to $4 \times 8 (= 32)$ *i. e.* as 15 is to 32. So that all Rectangles are to one another in a Ratio compounded of that of their Sides.

PRO

2. When Rectangles have their Sides proportionable, (so that $ab:eb::ad:ef$) then is the Rectangle A, to the Rectangle B, in a duplicate Proportion to the Ratio of the Sides.



For the Ratio of A to B, is compounded of the Ratio of ab to eb , and of the Ratio of ad to ef .

But in this Case ab is to eb , in the very same Ratio as ad is to ef ; and therefore the Proportion of A to B being compounded of those two equal Ratios, must be duplicate of the Ratio of their Sides to each other; that is, duplicate of the Ratio of ab to eb , or of ad to ef . Q. E. D.

COROLLARY:

Hence all Triangles, Parallelograms, Prisms, Parallelepipeds, Pyramids, Cones and Cylinders are to one another respectively compared, in a Proportion compounded of that of their Heights and Bases.

3. All Triangles, and Parallelograms, Pyramids, Prisms, and Parallelepipeds; also all Cones and Cylinders, each Kind compared among themselves: If they have equal Altitudes, are in the same Proportion as their Bases: If they have equal Bases, as their Heights.

For the Bases, or Heights, will severally be common Efficient or Multipliers; and therefore must make the Products be in the same Proportion as the Multiplicand was before.

Thus, if the equal Altitude of any two Triangles, Parallelepipeds, Cones, &c. be called a , and their unequal Bases b and d : Then by the 13th of Proportion (above) $b.d::a.b.a.d$.

This Problem being of constant Use, ought to be placed among the Elements of Geometry.

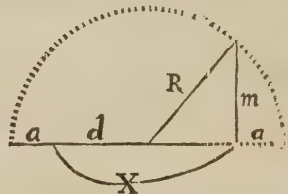
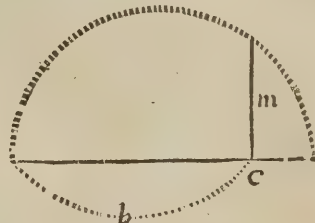
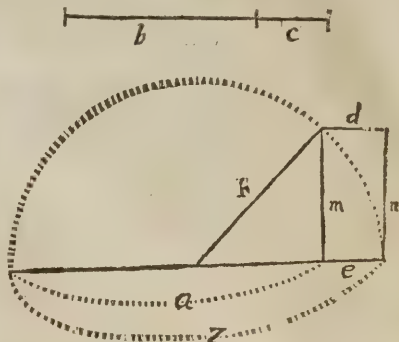
CASE I.

To find Two Right Lines, whose Sum and Difference is given, reciprocally proportional to Two given Lines.

PRO

Let the two given Lines be b and c , and let the Sum of the two Lines sought, be Z : 'Tis required to find a Point where Z may be so divided, as that $b.a::e.c$.

First find m a mean proportional between b and c , which erect perpendicularly at either End of Z : Draw d parallel to Z , and where it cuts the Circle let fall m , and draw R : Then, I say, a and e are the Segments required: For $ae=mm=bc$. Q. E. D.



CASE II.

Where the Difference $= X$ is given, find m as before, which erect perpendicularly at either End of X : Then draw R from the middle Point of X , and with it, as a Radius, describe a Semi-circle on the Center d : So shall $a + X$ be the greater Line, and a the lesser sought: For $a + X$, multiplied by $a = mm = bc$, Q. E. D.

That is, in other Words, if you have the Extreams, and the Sum and Difference of 4 Proportionals, you may find the Terms severally.

PROBLEM II.

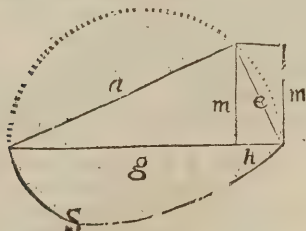
To find Two Squares, whose Sum or Difference is given reciprocally proportional to Two given Squares.

CASE

CASE I.

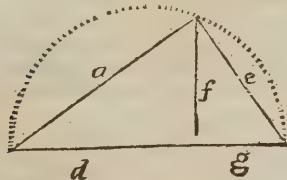
Let b and c be the Sides of the Squares given, and let S be equal to the Sum of the Squares required.

Find a fourth proportional to S b and c ; which suppose to be d : Then, by the former Problem find 2 Lines reciprocally proportionable to b and c , whose Sum is S : As suppose the Segments g and h , and draw the Lines a and e , which shall be the Sides of the Squares sought. For since $Sb::cd$. (or m): Therefore by Similar Triangles, $Sa::e.m$. Wherefore *ex aquo* reciprocally $b.a::e.c$. Wherefore their Squares will be also in the same Ratio. $Q: E. F.$



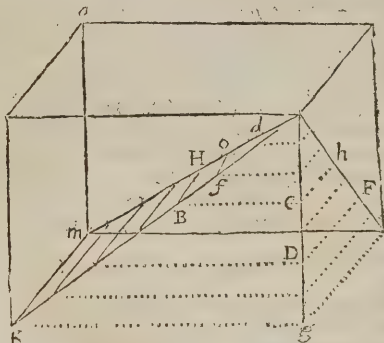
CASE II.

If d , the Side of a Square, which is the Difference of the Squares required, were given; make as $d.b::c.f$. a fourth Proportional; and, by the former Problem, find 2 Lines reciprocally proportional to b and c ; which suppose to be g and $d+g$, whose Difference is d : Then erect f at Right Angles, and on $d+g$, describe a Semi-circle: After which drawing a and e , they shall be the Sides of the Squares required.



Of the Proportion of Solids.

Every Parallelepiped, as ag , is to a Pyramid, $gkmnb$ of the same Base and Height, as 3 to 1.



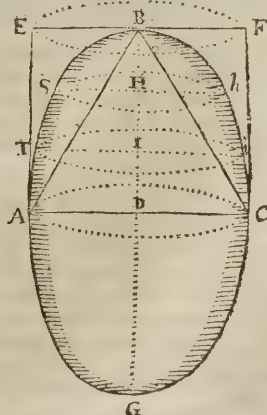
For if you suppose the Altitude bg , to be divided into any Number of equal Parts, by Plains parallel to the Base; then because of the Pyramids $bn g k m b$, $b F D B H b$, &c. being similar, the Bases $m n g k$ and $H B D F$, will be in a Duplicate Ratio of their Altitudes bg , $D b$. That is, These Bases diminish towards the Vertex in the Proportion of the Squares of Numbers in Arithmetical Progression.

But it was proved above in *Numb. 7. of Arithmetical Progression*, That a Rank of such Quantities are Subtriple to as many, equal to the greatest; *i. e.* to such as compose, or are the Elements of the Parallelopiped: Wherefore the Parallelopiped to the Pyramid, is as 3 to 1, or the former is triple of the latter.

And this must hold in all Prisms of what Figure soever; in reference to a Pyramid of the same Base with them.

And so also in the Proportion of Cones to Cylinders; for a Cone being composed of Circles whose Peripheries decrease Arithmetically, the Planes of those Circles must be a Rank of *Secundans*, (for they are as the Squares of their Radius) and consequently the whole Rank, or the Cone, will be Subtriple of the Cylinder, which is a Rank of as many Terms equal to the greatest.

A Cylinder, Spheroid, and Cone, of the same Base and Height, are as 3, 2, and 1:



Let the Semispheroid $ATSBh c$ be divided into 3 equal Parts, as in the Figure. Then the

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Ellipsis;

Ellipsis, as well as in the Circle) the $\square AD : \square SH :: \square GDB : \square GHB$; that is, as 3×3 (or 9) is to 5×1 (or 5). Also $AD : \square TI :: 9 : 8$. And thus it will be, if you make never so many new Bisections; that is, you'll find the Squares of the Ordinates, and consequently the Circles made on them do decrease by a Progression of odd Numbers. But a Series of such a Progression is to as many equal to greatest as 3 to 2 (by Corol 5. of *Progression Geometrical*) wherefore the Cylinder to the Spheroid is as 3 to 2, and being to the Cone as 3 to 1. The Cylinder, Spheroid, and Cone, are as 3, 2, and 1. *Q. E. D.*

PROPORTIONAL Spiral Lines. See *Spiral Lines*.

PROPOSITION, (in General) is a Thing proposed to be proved, made out, or demonstrated: And in Mathematicks, is either a *Theorem*, or a *Problem*; which see.

PROPRIETATE Probanda, is a Writ that lies for him that would prove a *Property* before the Sheriff: For where a *Property* is alledged, a *Replegiare* lieth not.

PROPTOSIS, is the Falling-down of some Part; as of the Eye, the Cawle, &c.

PRO Rata. See *Oneranda pro rata portionis*.

PROROGUE, signifies to prolong, or put off to another Day. The Difference between a *Prorogation* and an *Adjournment*, or Continuance of the Parliament, is, That by the *Prorogation* in open Court, there is a Session; and then such Bills as passed in either House, or both Houses, and had not the Assent to them, must at the next Assembly begin again: For every Session of Parliament is in Law a several Parliament; but if it be but *Adjourned* or Continued, then there is no Session, and consequently all Things continued in the same State they were in before the *Adjournment*.

PROSECUTOR, in Law, is he that follows a Cause in another's Name. See *Promoters*.

PROSODIA, is that Part of Grammar which teaches the Quantity of Syllables, distinguishing into Long and Short, &c.

PROSOPOEIA, is a violent Rhetorical Figure, wherein the Speaker addresses himself to inanimate Things as if they were living, and makes them speak as if they had Souls.

PROSPHYSIS, is a Coalition, or growing together, as when two Fingers are connected to each other.

PROSTAPHERESIS, in Astronomy, is the same with the Equation of the Orbit, or simply the Equation; and is the Difference between the *True* and *Mean Motion* of a Planet. The Angle also made by the Lines of the Planets *Mean* and *True Motion*, is called the *Prostapheresis*.

PROSTATÆ, *Adstantes*, or *Corpora Glandulosa*, are two Glandules placed near the Passage of the Seed; which (as may be guess'd) lubricate the common Passage of the Seed and Urine, and afford a kind of a Vehicle to the Seminal Matter, and are said to provoke the Titillation in Coition: Their Moisture being conveyed by certain little Tubes, which terminate in the Passage near where the Seed is ejected, and is emitted at the same time with it. The Learned *Bartholinus* has observed some such thing in Women.

PROSTASIS, a Part of Surgery, which fills up what is wanting; as we see in hollow and fistulous Ulcers filled up with Flesh by Surgery. *Blanchard.*

PROSTHESIS, in Grammar, is in the General

a Metaphism, and in particular an Addition of some Letter or Letters to the Beginning of a Word; as *Gnavus pro navus*. This is also called *Apposition*.

PROSTOMIA, the Red-tinctured Part of the Lips. *Blanchard.*

PROTECTION, in Law, hath a general and a special Signification: In the general, it is used for that Benefit and Safety which every Subject, Denison or Alien, especially secured, hath by the King's Laws. *Protection*, in the special Signification, is used for an Exemption or Immunity given by the King to a Person against Suits in Law, or other Vexations, upon Reasonable Causes moving him thereto. Of this *Fitz-Herbert* maketh two Kinds; the First he calls a *Protection, cum clausula volumus*, whereof he mentions Four Particulars: 1. A *Protection quia profecturus*, for him that is to pass over Sea in the King's Service. 2. A *Protection quia moraturus*, for him that is Abroad in the King's Service upon the Sea, or in the Marches. 3. A *Protection* for the King's Debtor: that he be not sued or attached till the King be paid his Debt: This the *Civilians* call *Moratorium*. 4. A *Protection* in the King's Service beyond Sea, or in the Marches of Scotland.

The Second Form of *Protection* is *cum clausula volumus*, which is granted most commonly to a Spiritual Company for their Immunity, from taking their Cattle by the King's Ministers: But it may be granted also to one Man Spiritual or Temporal.

PROTEST, in Law, hath two divers Applications; One is by way of Caution, to call witness, (as it were) or openly to affirm, That he doth either not at all, or but conditionally yield his Consent to any Act, or unto the Proceeding of any Judge in a Court wherein his Jurisdiction is doubtful, or to answer upon his Oath further than by Law he is bound. The other is by way of Complaint, to *Protest* a Man's Bill. For Example: If I give Money to a Merchant in France, taking his Bill of Exchange to be repaid in England by one whom he assigneth; if at my coming, I find not my self satisfied, but either delay'd or deny'd, then I go the Exchange, or other open Concourse of Merchants, and *Protest*, That I am not paid: And thereupon, if he hath any Goods remaining in any Man's Hands within the Realm, the Law of Merchants is, That I be paid out of them to my full Satisfaction.

PROTESTATION, in Law, is a Defence of Safeguard to the Party which maketh it, from being concluded by the Act he is about to do, that Issue cannot be joined by it.

PROTOPATHIA, is a Primary Disease, not caused by another.

PROTRACTING-Pin, is a fine Needle fastned in a Piece of Wood, Ivory, &c. used to prick off any Degrees and Minutes from the *Protractor*.

PROTRACTOR, is an Instrument used in Surveying: It is commonly made of a well polish'd thin Piece of Brass, and consisteth of a *Semi-circle* divided into Degrees, and a *Parallelogram* with Scales upon it, and may be of any Bigness desired. But this Instrument is so well known, that there needs no further Description.

Its Use is chiefly, To lay down an Angle of any assigned Quantity of Degrees: Or, an Angle being *Protracted*, to find the Quantity of Degrees it contains

contains readily; which is of great Use in Plotting, and making of Draughts; &c.

PROVISO, is a Condition inserted into any Deed, upon the Observance whereof the Validity of the Deed depends; but sometimes it is only a Covenant. It hath also another Signification in Matters Judicial, as if the Plaintiff or Demandant desist in prosecuting an Action, by bringing it to a Trial; the Defendant or Tenant may take out a *Venire facias* to the Sheriff, which hath in it these Words, *Proviso quod*, &c. to this End, That if the Plaintiff take out any Writ to that Purpose, the Sheriff shall summon but one Jury upon them both: In which Case, we call it going to Trial by *Proviso*.

PROW of a Ship, is that Part of her *Fore-castle* which is *Aloft*, and not in the *Hold*; and is properly that which is between the *Chase* and the *Loof*.

PRUNELLÆ Sal. See *Sal Prunella*.

PRUNIFEROUS-Trees or Shrubs, are such whose Fruit is pretty large and soft, with a Stone in the middle; in this kind the Flower adheres to the Bottom of the Base of the Fruit.

PSAMMISMUS, a Bath of dry and warm Sand, wherewith the Feet of Men in the Dropsy are dried. *Blanchard*.

PSEUDODIPTERON, is an Ancient Form of a Temple, compassed about with but one Row of Pillars, and which Row from the Wall, is at the Distance usually of two Rows of Pillars.

PSEUDOSTELLA, in Astronomy, signifies any kind of Comet or Phenomenon newly appearing in the Heavens like a Star.

PSOAS Magnus, or *Lumbalis*, is a Muscle of the Loins, which proceeds from all the Vertebrae of the Loins and their transverse Processes internally and laterally, within the Cavity of the *Abdomen*; from thence descending over the superior Part of the *Os Sacrum* and Spine of the *Ilium*, where it's joined with the fleshy Fibres of the *Iliacus Internus*, with which it's inseparably united to their partly fleshy and partly Tendinous Insertions in the inferior Part of the lesser *Trochanter* of the Thigh-Bone: It's Use is, together with the *Iliacus Internus*, to move the Thigh forwards.

PSOAS Parvus, is a Muscle of the Thigh, which arises fleshy from the superior Part of the first *Vertebra* of the Loins, internally and laterally within the *Abdomen*, immediately below the Cavity of the *Diaphragm*, whence descending obliquely inwards towards the *Pelvis Abdominis* (where it ceases to be fleshy) in a manner embracing the *Psos Magnus*, and is inserted with a thin, broad, strong Tendon, to that Part of the *Os Pubis*, where it is join'd to the *Os Ilium*: This Muscle, with its Partner Acting, assists the *Recti Abdominis* in drawing the *Ossa Pubis* upwards, as in raising our selves from a decumbent Posture. Thus Rope-Dancers hang by their Hands, and raise the inferior Parts of their Bodies, to take hold of a Rope with their Feet. Tho' their proper Action is to bend the Loins, yet their Tendons embracing the *Psos Magnus* and *Iliacus Internus*, (which we have frequently observed to extend over the inferior Parts) not unlike the *Fascia Tendinosa Cubiti* and *Lata* of the Thigh, do also Corroborate them in their Action. *Cowper*.

PSOROPHTHALMY, an *Ophthalmy*, or Inflammation of the Eyes with itching. *Blanchard*.

PSYOTICA, are cooling Medicines against the Scab. *Blanchard*.

PTARMICA, or *Sternutatoria*, are those things

which being endowed with a more piercing Acrimony than the Erthinnaceous Medicines, do so extremely irritate and shivel up the Membranes of the Brain, that it sends forth the pituitous Humour at the Nostrils, in an extraordinary Measure, and so cause Sneezing. *Blanchard*.

PTERIGOPALATINUS, or *Sphænopterygopalatinus*, is a Muscle of the *Gargareon*, whose former Appellation intimates its Progress and Insertion; the latter its Origin also. This arises from the Process of the *Os Sphenoides*, and descends according to the Length of the Interstice made by the internal *Ala* of the *Os Sphenoides* and *Musculus Pterigoidæus Internus* of the lower Jaw; and becoming Tendinous, marches over the *Processus Pterigoides*, and is inserted to the Fore-part of the *Gargareon*. The Tendon of this passes over the Pterigoidal Process, which, like a Pulley, gives it a different Power from that of the *Sphænopalatinus*, tho' they have both their Origin from the same Place. Wherefore, contrary to that, This draws the *Gargareon* downwards; which Contrivance in Nature is no less remarkable, than any of those where the like Artifice of a *Trochlea* is made use of.

PTERIGOPHARYNGÆUS, is a Muscle which arises thin and fleshy from both the Pterigoidal Processes of the *Os Cuneiforme*; also from the Root of the Tongue, and Extremities of the *Os Hyoides*; from these Places its fleshy Fibres run in a Semi-circular manner, embracing the superior and back Part of the glandulous Membrane of the *Fauces*, where they meet in a middle Line. When this Muscle acts, it brings the middle or back Part of the *Fauces* towards a Plain, by which means the *Tonsilla*, together with the rest of the Glandules, are compressed in the Evacuation of their *Mucus*, to join with the Aliment in its Descent into the *Stomach* in *Deglutition*; and at other times to promote *Screation*, in which this Muscle is the chief Instrument: That the *Tonsilla* approach towards each other, is observable, when we inspect these Parts in living Persons.

PTERIGOSTAPHYLINUS Externus, is a Muscle which moves the *Uvula*, arising from a small Protuberance upon the under Side of the Body of the *Os Sphenoides*; and goes directly to be inserted into the hinder Part of the *Uvula*.

PTERIGOSTAPHYLINUS Internus, is a Muscle which moves the *Uvula*; arising from a small Protuberance of the *Os Sphenoides*, and growing into a small round Tendon, which passes over a small Process like a Hook, of the *Processus Pterigoidæus*; from thence reverting, it's inserted into the Fore-part of the *Uvula*.

PTERYGIUM, is the Wing or round rising of the Nose or Eye, or the Process of the Bone *Sphænoïdes*, which is like a Wing. Also a membranous Excrecence above the horny Tunic of the Eye, call'd *Unguis* and *Ungula*, growing from the most part from the inner Corner, towards the Apple of the Eye, and often obscuring it. *Blanchard*.

PTERYGOIDÆUS Internus and Externus, are two Muscles arising from the *Processus Pterigoides*, or *Aliformis* of the *Os Sphenoides*. Their Use is to move the Jaw from Side to Side.

PTERYSTAPHYLINI, are Muscles of the *Uvula* or *Gargareon*, and were so named by *Riolanus*; but the Accurate Dr. *Croon* changed their Names into *Sphænopalatinus* and *Pterigopalatinus*, or *Sphænopterygopalatinus*. (See those Words.) Their Use is to give various Motions to the *Uvula*.

PTISANA, *Ptisana*, is a Decoction of Pearl-Barley, Liquorish, Raisins, &c. being a cooling pleasant Drink for one in a Fever, and much used by the French.

PTYLOSIS, is a Disease when the Brims of the Eye-lids being grown thick, the Hairs of the Eye-brows fall off. *Blanchard*.

PUBIS OS. See *Pectinis Os*.

PUDDINGS, in a Ship, are Ropes nailed to the Arms of the Main and Fore-Yards, near the Ends, and then at 3 or 4 due distances inwards one from another, in order to keep the Robbins from galling or wearing asunder upon the Yards, when the Top-sail-Sheets are haled home.

They call also those Ropes which are wound about the Rings of Anchors to save the Clinch of the Cable from being galled with the Iron, by this Name. So that when the Ring is so served, 'tis called the Pudding of the Anchor.

PUDICÆ Plantæ, the same with sensitive Plants; which see.

PUGILLUS, is an handful of any Herbs. Others interpret it, as much as may be taken up with the Thumb and two Fingers.

PUISNE, or *Puny*; the Lawyers term for Younger.

PULMONARIA Arteria, or *Vena Arteriosa*, is a Vessel in the Breast, arising immediately out of the Right Ventricle of the Heart; its Mouth is not so large as that of the *Cava*: It has three Valves, called *Segmentales* or *Semilunares*. Its Use is to carry the Blood from the right Ventricle of the Heart to the Lungs, and its Coat is double, like that of the Arteries.

PULMONARIA Vena, or *Arteria Venosa*, is a Vessel of the Heart, which discharges it self thro' the left Auricle into the Ventricle of the same side; for after it has accompanied the Wind-pipe and *Arteria Pulmonaris* in all their Branchings in the Lungs; and by its small Twigs has received the Blood out of the Artery, all these Twigs are united first into two Trunks (*viz.* the Right and Left) afterwards into one, which opens into the Left Ventricle of the Heart. This *Vein* hath no Valve in it, except that at its opening into the Left Ventricle, where at its Orifice are placed two Membranous Valves, called *Mitrales* from their Form resembling, when joined, something of a Mitre. These are very strong and firm, to sustain the violent Motion of the Blood, and to hinder it from returning back again into this Vein, and to direct its Course to the *Aorta*, whose Orifice opens in the *Systole* of the Ventricle.

PULMONARY Vessels, are those which carry the Blood from the Heart to the Lungs, and back again, being two in Number, *viz.* the *Pulmonary Vein*, and the *Pulmonary Artery*; which see.

PULPA, is the fleshy Part of Fruits, Roots, or other Bodies, which is extracted by Infusion or Boiling, and passing through a Sieve; as the Pulp of *Tamarinds*, *Alibes*, *Dates*, &c.

PULSE, by the Mathematical Naturalists, is the Term used for that Stroke with which any Medium is affected by the Motion of *Light*, *Sound*, &c. through it.

And the Admirable Sir *Isaac Newton* demonstrates, *lib. 2. prop. 48. Princip.* That the Velocities of the Pulses, in an Elastic Fluid Medium (whose Elasticity is proportionable to its Density) are in a Ratio, compounded of half the Ratio of the Elastic Force directly, and half the Ratio of the Den-

sity inversely. So that in a Medium, whose Elasticity is equal to its Density, all Pulses will be equally swift.

PULSUS, the Pulse, is the immediate Index of the Heart, by the Mediation whereof the Blood is diffused through the whole Body, and is differently affected thereby, according to the different Influx of the Animal Spirits; the Motion whereof is chiefly to be attributed to the circular and direct Fibres. Others affirm it to be the Dilatation and Contraction of the Heart and Blood. A Pulse is either natural or preternatural: of the former we have spoken already; the latter is such as is different, according to the different Circumstances of the Fibres and Animal Spirits; to wit, *strong*, *weak*, *swift*, *slow*, *equal*, *unequal*, *intermittent*, &c.

PULSES, according to Dr. *Abercromby*, are either,

Pulse Unequal, is either in respect of Time or Strength; that is, either it strikes quicker and slower, or else stronger and weaker.

Pulse Interrupted, is when the Strokes are much smaller than usual, or their Intervals much greater.

Pulse Intense, is that whose Stroke is very hard, (the Parts as it were upon a bent) or else this Strength is made up with the Multiplicity and Frequency of less Mications, as in the Heights of Fevers.

Pulse Remiss, is that whose Strokes are less quick, or less strong, and in Sickness shews more Danger than the other.

Pulse Superficial, is that which shews an exact Temperament of Body, as also a free and merry Temper of Mind.

Pulse Deep, shews a Disposition to Melancholy, Asthma's, Lethargy, &c. and is more frequent in the Aged than the Young.

Pulse Leaping, is said to portend no great Danger.

Pulse Trembling, shews great Extremity.

Pulse Wandring, is that which is sometimes felt in one place, and sometimes in another, and sometimes no where, and is never but a few Minutes before Death.

PULSION, is the driving or impelling of any thing forward. See *Attraction*.

PULVERIZATION, is reducing any Body into a fine Powder, which is done by beating *Frangible* Bodies in a Mortar; but to Pulverize *Malleable* ones, or such as will spread under the Hammer, some other Helps and Artifices must be made use of. To Pulverize Tin and Lead, proceed thus: Get a round wooden Box, which rub well with Chalk all over on the Inside; then melt the Metal, and pouring a little of it nimbly into the Box, shut the Lid, and shake the Box strongly and quick, and the Metal will be reduced by it into a Powder. And this is a very useful thing to know, tho' it be plain and easy; because by this means, these Metals are rendered fit for several Operations, and will easily be mixed with Salts or other Things.

PULVIS Fulminans. Mix well together three Parts of common Salt-petre, two Parts of Salt of Tartar, and one of common Brimstone, all finely powdered. Take half a Dram or a Dram of this Mixture, put it upon a Fire-shovel over a gentle Fire, so that it may heat, and appear to melt and change Colour gently, and in about half a quarter of an Hour it will go off with a terrible Noise, as great

great as that of a Musket, and yet without danger to any Person in the Room; for its Force is chiefly downwards. The Reason of this Effect appears to be, that the fix'd Salt of Tartar doth so lock up the Spirits of the Nitre and Sulphur, that they cannot get loose without breaking their Prisons, which when the Fire hath assisted and enabled them to do, they do it with very great Violence and Noise.

PUMP Brake, at Sea, is the Handle of the Pump, as,

PUMP Can, is the Bucket whereby they pour Water into the Pump to fetch it, and make it work when they intend to use it. And

PUMP Vale, is the Trough by which the Water runs from the Pump along the Ship-sides, that it may go out at the *Scoper-holes*.

PUNCTUM Lachrymale. See *Lachrymale Punctum*.

PUNCTUM Salient: In the Growth of an Egg, you see a little Speck or Cloud, as it were, in the innermost Tunic of it, called *Amnios*, which growing gradually thicker, acquires a kind of slimy Matter, in the middle whereof you see first this *Punctum Salient*, (a little Speck that seems to leap) afterwards the rude Body of an *Embryo*, which tends every day more and more to Perfection. *Blanchard*.

PUNY. See *Puifns*.

PUPILLA, or *Pupula*, is the opening of the Tunic of the Eye, called *Uvea*, or *Choroides*; it is round in a Man, and is capable of being contracted or dilated like a Muscle, according to the different Degree of Light the eye is Exposed to.

PUPPIS Vena, is that Vein which spreads it self about the hinder Part of the Head.

PURCHASE: This Word hath the same Sense at Sea, as *Draw* has a-Shore; thus they say, *The Capstan Purchases apace*; that is, draws in the Cable apace. And when they cannot draw or hale in any thing with the Tackle, they say, *The Tackle will not Purchase*.

PURFLEW; the Term in Heraldry to express *Ermines*, *Peau*, or any of the Furs when they compose a *Bordure* round a Coat of Arms. Thus they say, he Beareth *Gules*, a *Bordure Purflew*, *Verry*; meaning that the *Bordure* is *Verry*.

PURGATION, *Purging*, is an Excretory Motion quick and frequent, proceeding from a quick and orderly Contraction of the Carneous Fibres of the Stomach and Intestines, whereby the Chyle and Excrements, and corrupted Humours, either bred or sent there from other Parts, are protruded from Part to Part, till they be quite excluded the Body. *Blanchard*.

PURGATION, in Law, is the clearing of a Man's self of a Crime whereof he is generally suspected, and of the same accused before the Judge; and is either *Canonical* or *Vulgar*. The *Canonical*, is that which is prescribed by *Canon-Law*, the Form thereof is usually thus in the Spiritual Court: The Man suspected takes his Oath, that he is clear of the Fault objected, and brings so many of his Honest Neighbours, being not above Twelve, as the Court shall assign him, to swear upon their Conscience and Credulity, that he Swaereth truly. *Vulgar Purgation* was by *Fire* or *Water*, or by *Combat*, used both by Infidels and Christians, till by the *Canon Law* abolished: But *Combat* may be still practised by the Laws of the Realm in Causes doubtful, and where there is want of Evidence and other Proof, if the Defendant chuse rather the Combat than other Tryal.

PURIFICATION of a Metal, in Chymistry, signifies its being purged or cleaned from the Mixture of all other Metals.

'Tis chiefly used about Gold and Silver. The best

Purification of Gold, is by Antimony, in this manner: Put the Gold in a Crucible, make it red hot; and when it begins to melt, pour upon it by degrees four times its Weight of Antimony in Powder; the Gold will presently melt; continue a very strong Fire, till you perceive the Metal to sparkle; then take the Crucible out of the Fire, and knock it, that the Gold may sink to the Bottom; break it when 'tis cold, and separate the fine Gold, which is called the *Regule*, from the drossy Part.

After this, melt the *Regule* again over a strong Fire in a Crucible; and when it begins to melt, throw into it, by little and little, three times its Weight of *Salt-Petre*; continue a very strong Fire to keep the Matter in constant Fusion; and when the Fumes are all gone, and the Metal appears bright and clear, cast it into an Iron Mortar greased and warmed; or else if you don't value the Crucible, leave it in that to cool, and break the Crucible before 'tis quite cold; and then separate the *Regule* from its Dross remaining at the Top, the Gold will be very pure.

There are several other ways of Purifying Gold, as the *Depart* and *Cementation*, which see under those Words: But this is the best of all.

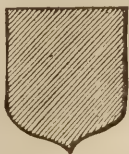
Red Gold is less valuable, as containing most Copper; the Yellow is better, and it should remain Yellow while 'tis in the Fire.

Purification of Silver, is made in the Coppel thus:

Heat the Coppel gently and by degrees, till it grow red hot; then cast into it four or five times as much Lead as you design to purify Silver: The Lead will soon melt, and fill the Sides of the Coppel; then put the Silver into the midst of the melting Lead, and it also will presently melt; then lay Wood all about and over the Coppel, and blow the Flame so that it may reverberate on the Matter, the Impurities of which will by this means mix with the Lead, and the Silver will remain pure and unmixed in the middle of the Coppel; and the Lead, mixed with the drossy Parts of the Silver, will lie on the Sides like a Scum: This Scum is to be taken off with a Spoon, or other Instrument, and is what is called *Litharge*; which, according to the degree of the Calcination it hath endured, is of divers Colours, and sometimes is called *Litharge* of Gold, and sometimes *Litharge* of Silver.

PURLUE, or *Purlieu*, from the *French* *Pur*, i. e. *Parus*, and *Lieu*, i. e. *Locus*, is all that Ground near any Forest, which being anciently made Forest, is afterwards, by Perambulations, severed again from the same, and exempted from that Servitude that was formerly laid upon it: And he that Walketh or Courseth within that Circuit, is not liable to the Laws and Penalties incurred by them which hunt within the Precincts of the Forest.

PURPURE, the Heralds Term for a Colour consisting of much Red and a little Black: And this Term is used in the Coats of all Persons below the degree of Noble; but in the Coats of Noblemen, 'tis called *Anetbist*; and in those of Sovereign Princes, 'tis called *Mercury*. 'Tis expressed in Engraving by



Lines

Lines drawn athwart the Esclutcheon, beginning at the *Dexter Point*.

PURSER, an Officer in the King's Ship, who receives her Victuals from the Victualler, and is to take care that it be in good Condition, and well laid up and stowed: His Office is also to keep a List of the Men and Boys belonging to the Ship, and to set down exactly the Days of each Man's Admittance into Pay, that so the Pay-Master, or Treasurer of the Navy, may issue out his Disbursements, and Pay Men off according to the *Purser's Books*.

PURSUIVANT. See *Poursuivant*.

PURVEYANCE. See *Purveyance*.

PURVEYOR. See *Purveyor*.

PUTREFACTION, is a slow kind of Corruption in Bodies, wrought generally by the Moisture of the Air, or some other ambient Fluid, which penetrating unto the Pores of Bodies, and being agitated in them, doth fetch or force out some of the more subtil and agile Parts of Bodies, loosen and dislocate the Parts in general one from another, and thereby quite change the Texture, and sometimes the Figure of the *Mixt*, from what it was before.

PUTTOCKS, or *Puttock Shrowds*, are small Shrowds which go from the Shrowds of the Main-Mast, Fore-mast, and Mizen-Mast, to the Top-Mast Shrowds. And if there be any Top Gallant-Masts on the Top-masts, there are *Puttocks* to go from the Top-Mast Shrowds into those. These *Puttocks* are at the Bottom seized to a Staff, or to some Rope which is seized to a Plate of Iron, or to a Dead-man's Eye, to which the Laniards of the Fore-Mast Shrowds do come.

PYCNOSTYLE, in Architecture, is a Building where the Pillars stand very close one to another, one Diameter and a half of the Column being only allowed for the *Intercolumniation*.

PYLORUS, or *Janitor*, is the lower Orifice of the Ventricle, which lets the Meat out of the Stomach into the Intestines; Dr. *Willis* calls the Beginning of the Pylorus, where its Coats are thickest, the *Antrum*.

PYRAMID, in Geometry, is a Solid Figure whose Base is a Polygon, and whose Sides are plain Triangles, their several Tops meeting together in one Point.

The Solid Content of

A *Pyramid*, is $=$ to $\frac{1}{3}$ of the Perpendicular Altitude multiplied by the Base; because a Pyramid is $\frac{1}{3}$ of a Prism of the same Height and Base. 7^e. 12. *Eucl.* which see also proved under the Word *Parallelopiped* (the same with Prism.)

The superficial Area of a *Pyramid*, is found by adding the Area of all the Triangles, whereof the Sides of the *Pyramid* consist, into one Sum: For the whole external Surface (except the Base) of any *Pyramid*, is nothing but a System of as many Triangles as the *Pyramid* has Sides.

If a *Pyramid* be cut with a Plane Parallel to the Base, the Surface of that Truncated *Pyramid* comprehended between the Parallel Lines, is found by

Subtracting the Surface of the *Pyramid* cut off from the Surface of the whole *Pyramid*.

Also the external Surface of a right *Pyramid*, that stands on a regular Polygon Base, is equal to a Triangle, whose Altitude is equal to the Altitude of one of the Triangles which compose it, and its Base to the whole Circumference of the Base of the *Pyramid*.

Whence therefore the Surface of a right *Cone*, (for a *Cone* is but a *Pyramid* of infinite Sides) is equal to a Triangle, whose Height is the Side of the *Cone*, and the Base equal to the Circumference of the Base of the *Cone*.

PYRAMIDALIA, are Vessels which prepare the Seed; of which in their proper place. Also Muscles of the Nostrils, and of the *Abdomen*, called *Pyramidales*, or of a Pyramidical Figure. Also two Strings of Marrow about the Basis of the oblongated Marrow.

PYRAMIDALIA Corpora. See *Corpora Pyramidalia*.

PYRAMIDALIS, *sive Succenturiatus Musculus*, one of the Muscles of the Abdomen, lying on the Rectus, helping in Conjunction with the rest, to compress the Abdomen, and to exclude its Contents: Mr. *Cowper* thinks it to have also a peculiar Use in compressing the Bladder.

PYRAMIDOID. See *Parabolick Pyramidoid*.

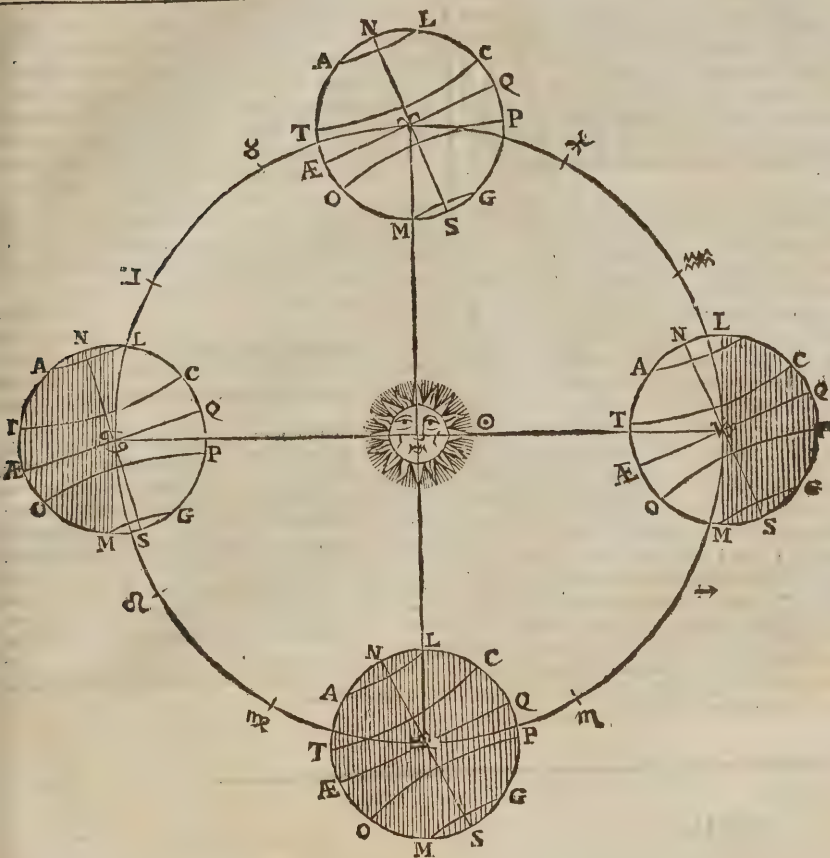
PYRIFORMIS, *sive Iliacus externus*, is a Muscle of the Thigh, which receives its first Name from its Figure, the second from its Situation; Its Beginning is round and fleshy from the inferior and internal Part of the *Os Sacrum*, where it respects the *Pelvis* of the *Abdomen*, and defending obliquely in the great *Sinus* of the *Os Ilium*, above the acute Process of the *Iscium*, and joining with the *Gluteus Medius*, it's inserted by a round Tendon to the superior Part of the Root of the *Great Trochanter*. This moves the *Os Femoris* somewhat upwards, and turns it outwards.

PYROTECHNICK-ART, is the Art of Chymistry, so called from the Greek *πῦρ* Fire, and *τεχνή* Art; because Fire is the chief Instrument the Chymist makes use of in the separating and collecting the purer Substances of mixt Bodies.

PYROTECHNIA, the same with *Chymia*.

PYROTICA, or *Urenia*, are Medicines virtually Hot, which being applied to Human Bodies, grow extremely hot; because that having Particles and Pores so ordered, that Vapours and Humours insinuate into them, the subtil Matter finds such Passages, that it being moved extreme violently, forces certain earthy, hard, and acute Particles, which float in the Passages upon the Neighbouring Parts with great Imperuosity, and so excites an Heat which corrupts or changes differently, according to the Diversity of its Motion and the Particles that are moved. Such are things that cause Redness, that Blister, that Ripen or Rot, that close up, and bring Wounds to a Crust, and that pull Hairs out of the Body. *Blanchard*.

PYRRICHIUS, is the Foot of a *Latin Verse* consisting of two Syllables, and both short.



PYTHAGOREAN System, is the same with the *Copernican*, but is so called, as being maintained by *Pythagoras* and his Followers, and therefore is the most ancient of any. In this the Sun is supposed at Rest in the Centre of our System of Planets, and the Earth to be carried round him annually in a Track or Path between *Venus* and *Mars*. I shall only add here an account how

The *Phænomena* of Day and Night, and the *vicissitudes* of Seasons are accounted for, according to the *Pythagorean* System, where the Earth moves round the Sun.

Let $\Gamma \Theta \Xi \Psi$ represent the Earth's Annual Orbit round the Sun at \odot . The Plane of which Orbit if infinitely produced among the Fix'd Stars, will describe that Circle which we call the *Ecliptick*. In this Orbit, let the Earth be supposed to move from Γ to Θ , next to Π , &c. and let the Earth be represented by the *Epicycles* $NA \Xi SQN$, in which N and S are the North and South Poles, and the Line NS the Earth's Axis always keeping Parallel to it self; and ΞQ , the Equator, whose Plane is inclined to the *Ecliptick* with an Angle of $23^{\circ} 30'$, which is the Complement of $66^{\circ} 30'$, the Angle that the Earth's Axis (perpendicular to the Plane of the Equator) makes with the *Ecliptick*.

Suppose then the Earth in Ξ (then will the Sun appear to be in Γ , the first Point of its Annual

Orbit) and the Earth so turning it self to the Sun, that the Axis of its Motion may be Perpendicular to a Line drawn from the Center of the Sun to that of the Earth, then will the Earth's Equator appear Coincident with the Celestial Equinoctial; and the Sun will appear to be just in the middle between the two Poles, and to send his Light equally towards both of them, and as far as both of them (for the Sun always illuminates one half of the Globe.) Wherefore as that Hemisphere of it (*viz.* $TNLCP$) which is now turned towards him, is *Enlightened*, so the other (behind) is now supposed to be in *Darkness*. And because the Earth revolves round its Axis NS in 24 Hours, which Axis is now at Right-Angles with the Line $\Gamma \odot \Xi$ connecting the Centres of the Earth and Sun, every Point of the Equator ΞQ , and of the Tropicks TC and OP , and of all other Parallels to the Equator, will be as much in the Light as in the Dark, in every Diurnal Revolution; and consequently the Days and Nights will be Equal, at that Time, all over the Earth.

But as the Earth moves further on in the Annual Orbit towards Π and χ , the Plane of the Terrestrial Equator will be then no more direct to the Sun, but will subside towards the South, and therefore the Sun will appear to go as much toward the North Pole, and as it were from the Equator in the Heavens; for the Earth being ap-

parently at Rest, its Equator will be so too, and consequently the Celestial Equinoctial will appear to change from its Position by a diurnal Motion, and the Sun will appear to move also, because it changes its Position in respect to the Equinoctial in the Heavens. And the Sun's Light which before reached just as far as the Poles N and S, will now go beyond N, and will fall as much short of S.

But when the Earth is come to ϖ , the Sun then will appear to be in \odot , where he will seem most of all to decline from the Equator towards the North, viz. as much as is the Angle of Inclination between the Plane of the Equator and that of the Ecliptick; and the Sun will then seem to move all Day in the Circle TC, which is a Parallel to the Equator at $23^{\circ} 30'$ distance, and is called the Tropick of \odot . The Earth being thus posited, 'tis apparent that the Sun's Rays enlightening always one half of it, will now reach beyond the Pole N, as far as L, and fall short of the Southern Pole S, by the Ark SM = to LN = to $23^{\circ} 30'$ the Inclination of the Ecliptick to the Equator; and therefore if 2 lesser Circles are imagined to be there drawn on the Earth, they will be the Polar Circles as AL and MG: And 'tis plain that that Part of the Earth which lies between the Polar Circle AL and the Pole, will enjoy perpetual Day, notwithstanding the Earth's diurnal Motion, as the opposite Part within the Antarctick Circle MG will be in continual Darkness. The Earth being thus in ϖ , and the \odot appearing in \odot , 'tis plain also that of every Circle parallel to the Equator in the North-

ern Hemisphere, the greatest Part, or more than a Semicircle, will be Illuminated; but from the Equator towards the South Pole, the greatest Part of every Parallel will be in Darkness: Wherefore in all Places lying to the Northward of the Equator, the Days will be longer than the Nights; that is, it will be Summer; as in the Southern Hemisphere the Nights will be longer than the Days, where it will be Winter; and this in Proportion to the Place's Distance from the Equator: But to those who live under the Equator, or the Line, (as the Seamen call it) the Days and Nights will be equal now, and at all Times of the Year.

The Earth moving on its Annual Orbit from ϖ into \mathfrak{X} , and so to Υ it will arrive at the other Equinoctial Point, and then the Sun will appear to be in \mathfrak{X} , and all Things will be the same as when the Earth was in \mathfrak{X} , which hath been above deliver'd.

The Earth going on in its Orbit from Υ , to Π , and so to \odot , the Sun will then appear to be in ϖ , and consequently in the Winter Tropick, as we call it in reference to our Position toward the Sun: And now the State of Things with us will be the Reverse of what it was when the Earth was in ϖ , our Nights will be longer than our Days, &c. as appears from the Figure; and it will fare with us Inhabitants of the Northern Hemisphere, in all respects, as it did then with the Inhabitants of the Southern.

PYXIS, is the Cavity of the Hip-Bone, which is called *Acetabulum*.

QUA

QUADRANGLE, or *Quadrangular Figure*, in Geometry, is that which hath no more than four Angles.

QUADRANT, is an Arch which is the fourth Part of a Circle, containing 90° deg^r. And oftentimes the space contained between a Quadrantal Ark, and two Radius perpendicular one to another in the Centre of the Circle, is called a *Quadrant*; from the Figure of which the following Instrument takes its Name, which is called a

Quadrant, and is a very useful and ready Instrument, when well made, for many Operations. The Limb of it is divided into 60 Degrees, and as many Parts of a Degree as the Signess of the Instrument will bear, and this by means of a String and Plummer, (or Label, if it be a screw'd Limb) gives you the Sun's Altitude, or that of any Star or other Object above the Horizon, reckoned from that Edge of the Quadrant where the Sights are not placed. In *Collin's* Quadrant, this Limb is also divided into Time, and numbred accordingly, and then it serves very readily to find the Sun's right Ascension either in Degrees or Time, and to shew the Hour of the Day there to a Minute, by his Altitude. Next to the Limb, in *Center's* Quadrant, is the Calendar of the Months placed; but in *Collin's* 'tis put in four little Quadrantal Arks next the Center of the Instrument, having an Ark also of the Sun's Declination fitted thereunto; so that the String laid to the Day of the Month, will shew the Declination; or laid to the Declina-

QUA

tion, will give the Day of the Month, in the Quadrantal Ark proper for that Season of the Year. Next below this, in *Mr. Collin's* Quadrant (which I judge to be the best) is the Projection, which is a 4th Part of *Stoffler's Astrolabe*, inverted and fitted to the Latitude of London; of which those Lines which run from the Right Hand towards the Left are Parallels of Altitude, and those which cross them are Azimuths. In the Projection are drawn the two Eclipticks, with the Characters of the Signs upon them, and the two Horizons, all issuing from the same Point; and up and down in the Projection are placed such eminent fixed Stars, as are between the Tropicks. Next below the Projection is the *Quadrat* and Line of Shadows, being only a Line of Natural Tangents to the Arks of the Limb; and by its help, the Heights of Towers, Steeples, &c. may be pretty exactly taken.

QUADRANT of Altitude, is part of the Figure of an artificial Globe, being a thin Brass Plate divided into 90 Degrees, and marked upwards with 10, 20, 30, &c. being rivetted to a Brass Nut which is fitted to the Meridian, and hath a Screw in it, to screw upon any Degree of the Meridian; when it is used, 'tis most commonly screw'd to the Zenith. Its Use is for measuring Altitudes, to find Amplitudes and Azimuths, and describing Almucantars.

QUADRANT Astronomical, see *Astronomical Quadrant*.

QUADRANT *Triangular.* See *Triangular Quadrant.*

QUADRANTAL Triangle, is a Spherick Triangle, one of whose Sides (at least) is a Quadrant, and one Angle Right.

QUADRAT, and Line of Shadows on a Quadrant, are only a Line of natural Tangents to the Arks of the Limb, and are placed there in order to measure Altitudes readily, for it will always be; as the Radius to the Tangent of the Angle of Altitude at the Place of Observation; (that is, to the Parts of the Quadrat or Shadows cut by the String) :: so is the Distance between the Station and Foot of the Object to its Height above the Eye.

Quadratick Equations.

QUADRATICK Equations, are such as retain on the unknown Side, the Square of the Root or Number sought; and are of two sorts.

I. *Simple Quadraticks*, where the Square of the unknown Root is equal to the absolute Number given, as $aa = 36$, $ee = 146$, $yy = 133225$. And for the Solution of those, there needs only to Extract the Square Root out of the known Number, and that is the Value of the Root or Quantity sought: Thus the Value of a in the First Equation is equal to 6, in the Second $e = 12$ and a little more, it being a Surd Root. And in the Third Example $y = 365$.

II. *Affected Quadraticks*, are such as have between the highest Power of the unknown Number and the absolute Number given, some intermediate Power of the unknown Number, as $aa + 2ba = 100$.

And this Equation is properly called *Affected*; because the unknown Root a is Multiplied into the Coefficient $2b$.

The Original of *Affected Equations*, the Ingenious Mr. Harriot thus derives: Let a be $= +b$, or $a = -c$, then by Transposition will $a - b = 0$, and $a + c = 0$. And then multiplying one by another, the Product is $aa - ab + ca - bc = 0$.

And this he properly calls an *Original Equation*. From which, or others of the same Kind, Transposing bc over to the other Side with a contrary Sign, he gains such an Equation as this, $aa - ab + ca = bc$, which he calls a Canonical Equation.

And from hence, by putting Examples in all Cases, he shews, that every possible Quadratick Equation hath two real Roots, according to the Dimensions of the highest Power; as being made up by the Multiplication of two simple Equations. And that these two Roots may be either both Affirmative, or both Negative; and that sometimes they are equal to each other, and sometimes not. And from hence he finds, that the absolute Number bc is always the Rectangle of the two Roots b and c , (or of the two Values of a): And that if it have a positive Sign, the two Roots have like Signs, but if a Negative one, unlike.

And, That the Coefficient of the middle Term is always the *Aggregate of both the Roots with contrary Signs*; and consequently their *Difference*, when without its Sign. See more in his *Second Section*, and in *Wallis's Algebra*, p. 132, §7c.

And when in such Kind of Quadraticks as these, the Index or Exponents of the Dimensions of the unknown Root are in Arithmetical Proportion, that is, as in this Equation, $aa + 2ba = 100$, the Index of aa is 2, the Index of $2ba$ is 1, and the Index of 100 is 0; then may the Root be easily found out by the following Method.

All Equations of this Rank will be in one of these three Forms.

$$\begin{array}{l} aa + a = dR \\ aa - a = dR \\ as - aa = R \end{array} \quad \left\{ \begin{array}{l} * \text{ Some make four Forms;} \\ \text{but at long run it comes} \\ \text{to the same Thing.} \end{array} \right.$$

In all which Forms, R , the absolute Number given, is a Rectangle or Product made out of the two Quantities or Roots sought, a Greater and a Lesser.

Of which in the *First Form*, where all is Affirmative, the Coefficient d is the Difference between those two Quantities or Roots; and a is the Lesser of them, as is plain if you suppose the two Roots (as *Oughtred* doth) to be a the greater, and e the Lesser. For then let $d = x$ be the Difference between them: So that $e + x = a$. If then you multiply each Part by e , it will be $ee + ex = ae$; from whence it appears also plainly, that ae is equal to R , the absolute Number given, or equal to the Rectangle of the two unknown Roots a and e , of which in this Form, the Coefficient x or d is equal to the Difference between them, and e is the Lesser of them.

In the *Second Form*, The Coefficient d is the Difference of the two Roots as before, but a there represents the Greater of them, as is plain by putting (because the Sign is Negative) $a - x = e$, and multiplying each Part by a , it produces $aa - ax = ae$, the second Form, where x or d the Coefficient is the Difference of the two unknown Roots; and a represents the greater of them.

In the *Third Form*, where the highest Power is Negative, the Coefficient s is the Sum of the two Quantities or Roots sought; and a the Affirmative Root sought, may be either the Bigger or the Lesser of them. For let (because the highest Power is Negative) $z - a = e$; then multiplying both by a it will $za - aa = ae = R$. or if $z - e$ had been put equal to a , then it would have been $ze - ee = ae$, by multiplying all by e .

So that this Method shews you the Original Constitution of these Forms, and the Nature and Office of each Member of them.

From all which may be found this general Canon for the Solution of Quadratick Equations, according to this Method.

Multiply the absolute Number by 4, and to the Product add the Square of the Coefficient, then Extract the Square Root of that Sum: Which Root shall be the Sum of the two Numbers sought. Then to or from the half of that Root, add and subtract half the Coefficient, and the Sum and Remainder are the two Roots required.

For the particular Solution of affected Quadratics there are three Ways.

I. *That of Oughtred, who proceeds in this Method.*

In all the three Forms, there is given either the Rectangle and Sum, or the Rectangle and Difference of the two unknown Quantities; whence 'tis very easy to find either the Difference in the former, or the Sum in the latter Case: And then having the Sum and Difference of any two unknown Quantities, the Quantities themselves will soon be known.

Thus in the first Form, let $aa + da = R$.

Here is given R the Rectangle of the Roots, d their Difference; and 'tis known that a represents the lesser of them. Let S stand for the Sum to be sought.

Let $a + e = S$ and $a - e = d$, Then $aa + 2ae + ee = SS$, and $aa - 2ae + ee = dd$, Subtract the latter from the former, and there remains only $4ae = 4R$. Wherefore $SS - dd = 4R$.

You may therefore by simple Algebra find that $4R = SS - dd$, and consequently that $4R + dd = SS$, and therefore S is known; and then having S and d , a the lesser Root will be known too, for $\frac{1}{2}S - \frac{1}{2}d = a$.

Again, in the second Form. Let $aa - ad = R$.

Here d and R (as before) the Difference and Rectangle of the two Roots are given; and a the greater of them; wherefore 'tis easy to find S the Sum, and then $\frac{1}{2}S + \frac{1}{2}d = a$.

In the third Form, where $Sa - aa = R$.

There is given the Coefficient S = Sum of the unknown Roots, A the Rectangle between them; and a may be either the bigger or lesser of them; Here therefore to find d the Difference.

Because $SS - dd = 4R$, therefore $SS + 4A = dd$, and consequently d is known; and then $\frac{1}{2}S + \frac{1}{2}d =$ greater, and $\frac{1}{2}S - \frac{1}{2}d =$ lesser.

II. *The Solution of Adjected Quadratick Equations, by the Method of Compleating the Square.*

Which is by Mr. Harriot, thus: Since in every one of the three Forms of Quadraticks, one quarter of the Square of the Coefficient will make the unknown Side of the Equation a Compleat Square, whose true Root will be $a + \frac{1}{2}d$ (or whatever Letter else be the Coefficient.) 'Tis plain by this means, an Adjected Quadratick Equation, may be reduced to a Simple one.

Wherefore,

In the first Form, where all the Species are Affirmative.

$$\text{Let } aa + da = R$$

If $\frac{1}{4}d$ be added to the unknown Side, it will be a perfect Square $aa + da + \frac{1}{4}dd$, whose true Root is $a + \frac{1}{2}d$.

Add then, $\frac{1}{4}dd$ to R, and $R + \frac{1}{4}dd$ will be a perfect Square Number and known: Whose Square Root extracted in Numbers, will be equal

to $a + \frac{1}{2}d$; and consequently, a will be equal to that Root, when d is taken from it, and so a will be known.

The Practical Rule is this,

To the absolute Number, add $\frac{1}{4}$ of the Square of the Coefficient, (or the Square of half the Coefficient) and extract the Root of the Sum; then from that Root found in Numbers, subtract $\frac{1}{2}$ the Coefficient, and the Remainder is a , the lesser of the two Roots, or Values of a .

Example.

$$\begin{aligned} aa + da &= R \\ \text{or } aa + 16a &= 36 \\ \text{to } 36 &= R \\ \text{add } 64 &= \frac{1}{4}dd \\ \hline \sqrt{100} &= 10 = a + \frac{1}{2}d \\ \text{but } \frac{1}{2}d &= 8 \end{aligned}$$

therefore $2 = a$.

In the Second Form.

$$\text{Let } aa - da = R.$$

Proceed in all respects as in the first Form, only you must at last add $\frac{1}{2}$ the Coefficient to the Root Extracted out of the absolute Number instead of taking it from it, as before: because here a represents the greater Root; and thus, if $aa - 16a = 36$, a will be found = to 18.

In the Third Form.

$$\text{Let } Sa - aa = R.$$

Here because the highest Power is Negative, 'tis impossible any such Root can be found that will produce $-aa$; wherefore you must imagine all the Signs changed, and then it will stand thus; $-Sa + aa = -R$, or putting the highest Power first, $aa - Sa = -R$.

In this Form, the Coefficient is the Sum of the two Roots, and a may be either of them.

And here the absolute Number is so determined as that it cannot be greater than the Square of half the Coefficient: For,

If the absolute Number be = to the Square of half the Coefficient, the Roots are equal.

The Practical Rule then is this:

From the Square of half the Coefficient, take the absolute Number given; and extract the Square Root of the Remainder; which Root either added to, or subtracted from half the Coefficient, will give accordingly the greater or lesser Value of a .

$$\begin{aligned} \text{Thus: If } 20a - aa &= -36 \\ \text{or } Sa - aa &= -R \\ \text{From } 100 &= \frac{1}{4}SS \\ \text{take } 36 &= R \\ \hline \sqrt{64} &= 8 \\ \text{now } 10 + 8 &= 18 \text{ the greater Root,} \\ \text{and } 10 - 8 &= 2 \text{ the lesser Root.} \end{aligned}$$

III. To

III. To Solve Quadratick Adfected Equations, by taking away the Second Term.

In any of the Three Forms, if the Coefficient have a Negative Sign, put $e + \frac{1}{2}d$; but if it have an Affirmative Sign, put $e - \frac{1}{2}d$; instead of a , the Root of the highest unknown Power.

$$\text{Then will } ee + ed + \frac{1}{4}dd = aa \\ \text{also } \overline{e + \frac{1}{2}d} + \frac{1}{4}dd = \overline{a}d.$$

And these two Quantities added together, must be equal to the Absolute Number given, and the Equation will become a Simple one.

In the First Form,

$$aa + da = R, \text{ or } aa + 16a = 36. \\ \text{Let } e - \frac{1}{2}d = a,$$

$$\text{Then will } ee - ed + \frac{1}{4}dd = aa \\ \text{and } ed - \frac{1}{4}dd = ad \\ \text{which added together make } ee - \frac{1}{4}dd = R \\ \text{Therefore } ee = R + \frac{1}{4}dd$$

$$\text{And consequently } e = \sqrt{R + \frac{1}{4}dd}$$

$$\text{But } e - \frac{1}{2}d = a, \\ \text{Therefore } e = a + \frac{1}{2}d$$

$$\text{Consequently } a + \frac{1}{2}d = \sqrt{R + \frac{1}{4}dd}$$

$$\text{Wherefore } a = \sqrt{R + \frac{1}{4}dd} - \frac{1}{2}d. Q.E.D.$$

And since $a + \frac{1}{2}d = \sqrt{R + \frac{1}{4}dd}$: If each part of the Equation be Squared, there will arise,

$$aa + ad + \frac{1}{4}dd = R + \frac{1}{4}dd$$

Which is the other common Canon for Solving Quadraticks, by adding to each Part the Square of half the Coefficient, in order to compleat the Square.

In the Second Form,

$$aa - ad - R. \\ \text{Let } e + \frac{1}{2}d = a.$$

$$\text{Then is } ee + ed + \frac{1}{4}dd = aa \\ \text{and } -ed - \frac{1}{4}dd = ad$$

$$\text{These added make } ee - \frac{1}{4}dd = R \\ \text{Therefore } ee = R + \frac{1}{4}dd.$$

$$\text{and } e = \sqrt{R + \frac{1}{4}dd}.$$

$$\text{but } e + \frac{1}{2}d = a \\ \text{Therefore } e = a - \frac{1}{2}d.$$

$$\text{And consequently } a - \frac{1}{2}d = \sqrt{R + \frac{1}{4}dd}.$$

$$\text{Wherefore } a = \sqrt{R + \frac{1}{4}dd} + \frac{1}{2}d. \\ Q. E. D.$$

And since $a - \frac{1}{2}d = \sqrt{R + \frac{1}{4}dd}$; if each Side of the Equation be Squared, you will have,

$$aa - ad + \frac{1}{4}dd = R + \frac{1}{4}dd.$$

Which is the common Canon for Solving Equations by completing the Square.

In the Third Form,

$$da - aa \geq R.$$

Which Form must be thus changed,

$$aa - da = -R.$$

$$\text{Then make as before, } e + \frac{1}{2}d = a \\ \text{and then } ee + ed + \frac{1}{4}dd = aa \\ \text{and } -ed - \frac{1}{4}dd = -ad.$$

$$\text{Whose Sum is } ee - \frac{1}{4}dd = -R \\ \text{Then is } ee = \frac{1}{4}dd - R.$$

$$\text{And } e = \sqrt{\frac{1}{4}dd - R}.$$

$$\text{And since, } e + \frac{1}{2}d = a \\ e = a - \frac{1}{2}d = (\sqrt{\frac{1}{4}dd - R}).$$

Wherefore (because there are two Positive Roots in this Form)

$$a = \sqrt{\frac{1}{4}dd - R} + \frac{1}{2}d.$$

But the Value of a is Ambiguous, and you must generally try both Roots before you can find which will Solve the Question; Whereas in the other two Forms, the first a found, will be that required.

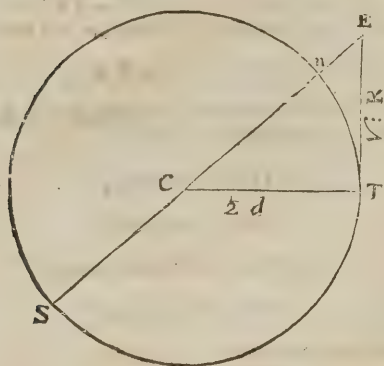
N. B. In this way of Solving *Quadraticks*, the known Quantity added to, or Subtracted from e , must be always half the Coefficient.

Construction of Adfected Quadraticks.

The Construction of *Simple Quadraticks*, you have before under *Simple Equations*: That of *Adfected* ones, is easily done many ways.

I. In the First Form of Quadraticks, let $aa + da = R$. Then by the common Method of Solution, $a = \sqrt{R + \frac{dd}{4}} - \frac{d}{2}.$

Where



Wherefore describe a Circle whose Radius shall be $CT = \frac{1}{2}d$, and make the Tangent $TE = \sqrt{\frac{1}{2}R}$, drawing also the Secant SCE ; then will $CE =$

$$\sqrt{\frac{1}{2}R + \frac{d^2}{4}} \text{ (by 47. e. 1. Euc.) and consequently}$$

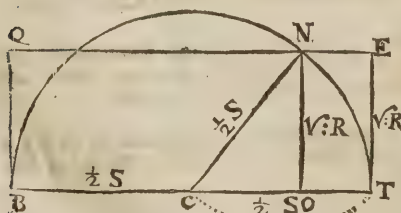
$$nE = \sqrt{\frac{1}{2}R + \frac{d^2}{4}} - \frac{1}{2}d = a.$$

II. In the Second Form, where $aa - da = R$,

a will be equal to $\sqrt{\frac{1}{2}R + \frac{d^2}{4} + \frac{d}{2}}$. And consequently, The same Construction and Diagram will serve here, which was used in the first Form: And the Root will be represented by $SE = \sqrt{\frac{1}{2}R + \frac{d^2}{4}} + R \frac{1}{2}d$.

III. In the Third Form, where $Sa - aa = R$,

a will be equal to $\frac{S}{2} + \sqrt{\frac{SS}{4} - R}$, and here the Root a hath two real Values; make $CT (= \frac{1}{2}S)$ the Radius of a Circle, and erect the



Perpendicular $ET = \sqrt{\frac{1}{2}R}$; then draw EQ Parallel to CT , and NO Parallel to ET , draw also the Radius CN . Then will (by

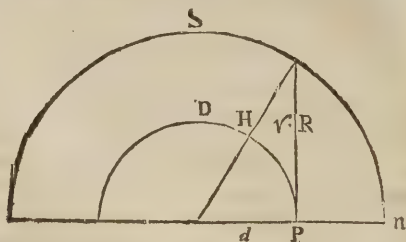
$$47. e. 1 \text{ Euclid.}) CO = \sqrt{\frac{SS}{4} - R}, \text{ and}$$

$$\text{consequently, } BO = \frac{S}{2} + \sqrt{\frac{SS}{4} - R} =$$

the greater Root a , and $OT = \frac{S}{2} - \sqrt{\frac{SS}{4} - R}$. Or the two Roots will be QN , and NE ; equal to the two former.

Dr. Wallis's way of Construing the Three Forms of all Quadratick Equations, according to Mr. Oughtred's Method of Solution.

Draw two Concentrick Circles, and let the Diameter of the greater be called S , and the Diameter of the lesser D , the Sum and Difference of the Roots found. Wherefore H and d will represent the half Sum and half Difference of the Roots.



Since therefore Oughtred's Theorem, as is shew'd above, is, That $SS - DD = 4R$. Wherefore $SS - DD = R$

fore, : divide all by 4 : $\frac{SS - DD}{4} = R$. Let

$\frac{1}{2}R$ be made a Tangent to the lesser, or a Right-Sine to the greater Circle, as you see in the Figure according as D , or S , is given: And draw also the Hypotenuse H . Then will the Base of the Triangle be d . And $HH - dd = R$ (by 47. e. 1.)

That is, $\frac{SS - DD}{4} = R$. Wherefore by Trans-

position, $\frac{4}{4}HH = R + dd$, and therefore $H = \sqrt{\frac{1}{2}R + dd}$. And consequently, if it had been in the first or second Forms, where d and R were given, H will also be found. Or if H had been given, and d required as in the third Form, since, $HH = R + dd$: Therefore, $HH - R = dd$; And $\sqrt{HH - R} = d$: And having thus found A and d , the $\frac{1}{2}$ Sum and $\frac{1}{2}$ Difference of the two Roots: Then $H + d (= op)$ will be the greater Root a , and $H - d (= pn)$ will be the lesser, which will be Affirmative or Negative, according to the Form and Circumstances of the Equation.

A Question and Problems in Affected Quadratick Equations.

QUESTION.

Two Men have each a certain number of Crowns, whose Sum Subtracted from the Sum of their Squares, leaves $R = 78$: But their Sum added to the Product of the two Numbers, makes $39 = S$. How many Crowns had each?

For the unknown Sum of the Numbers put $2a$. And for their Difference $2e$.

For then the Numbers may be thus Noted, $a + e =$ the greater, and $a - e =$ the lesser.

Then

Then,

	1	$2aa + 2ee = \text{Sum of their Sq.}$
$x - 2a$	2	$2aa + 2ee - 2a = R: \text{ by the State of the Question.}$
$2 \div 2$	3	$aa + ee - a = \frac{R}{2} \quad 39 = S.$
by Transp.	4	$39 - aa + a = ee \text{ which Step will at last help to find } e.$
$\square + 2a$	5	$aa - ee + 2a = S. \text{ Their Product added to their Sum.}$
by Transp.	6	$aa + 2a - S = ee.$
$4 \cup$	7	$39 - aa + aa = aa + 2a - 39 (S) = ee.$
by Transp.	8	$78 = 2aa + a.$
	9	$aa + \frac{1}{2}a = 39 = S, \text{ which is a Quadratick of the first Form.}$
Comp. \square	10	$aa + \frac{1}{2}a + \frac{1}{4} = 39 + \frac{1}{4}.$
u	11	$a + \frac{1}{4} = \sqrt{39 + \frac{1}{4}}.$
	12	$a = \sqrt{39 + \frac{1}{4}} - \frac{1}{4} = 6.$
	13	Therefore $2a = 12.$

And (a) being known, the value of (e) will be found from the fourth Step. Where $e = 3$.
Now by our Supposition at first, the greater Number was $a + e$, that is 9; and the lesser was $a - e$; that is 3: Which numbers 3 and 9, will Answer the Question.

For 12, their Sum, taken from 9c, the Sum of their Squares, leaves 78; and added to 27, their Rectangle, makes 39.

N. B. By this Method of putting $a + e$ and $a - e$ for the two Numbers sought, instead of a and e as in the Common way; many Questions producing Affected Quadratick Equations, when that way manag'd, may be solv'd as easily, and in the manner of Simple Equations. Especially when the Sum and Difference, or Sum or Difference of the Squares of the Quantities sought, are among the Data.

PROBLEM I.

The Difference of both the Legs of a Right angled Triangle being given from the Hypothensuse; to find the Sides severally, and to Form the Triangle.

Let the Difference of the lesser Side from the Hypothensuse be (b) and that of the greater (d).

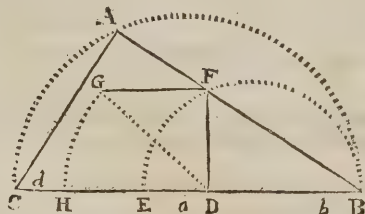
For the greater Side sought put (a)

Then will,

	1	$a + d = \text{Hypothensuse, and}$
$x - b$	2	$a + d - b = \text{to the lesser Side.}$
47. e. 1.	3	$aa + 2ad + dd = 2aa + 2ad - 2ab - 2bd + dd + bb.$
	4	$aa - 2ab - 2bd + bb = 0.$
		by Comparison and Transposition of the last Step.
Transp.	5	$aa - 2ab = 2bd - bb. \text{ which is a Quadratick Equation of the Second Form.}$
Comp. \square	6	$aa - 2ab + bb = 2bd.$
	7	$a - b + \sqrt{2bd} = a = \sqrt{2bd} + b.$

Geometrical Construction.

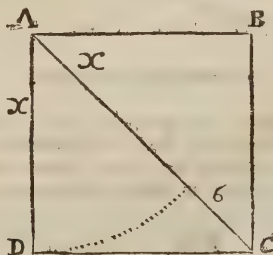
Find a mean Proportional between d and b , which let be DF : to which, place at Right-angles $FG \perp$ to DF , Draw GD , and cut off $HD = GD$. Then will BH , be the greater Side sought. And this being



produced to C (so that $CH = ED$) will give $CD (= AC)$ the lesser Side of the Triangle required, for $a + d - b =$ lesser Side; Draw a Semi-circle on CB and apply $AB = HB$. Then draw AC , and the Triangle is found, which is ACB .

PROBLEM II.

Having in the Square $ABCD$, the Difference between the Sides and Diagonal $= 6$, or a , to find the Side of the Square.



Let the Side sought be called x , and $6 = a$.

Then $x + a = AC$ the Diagonal.

But (by 47. e. 1. Eucl.) $AC^2 = 2AD^2$, or to $2xx$.

That is $xx + 2xa + aa = 2xx$.

Expunge then xx on both Sides, and it will be $2xa + aa = xx$, and then by Transposition, $xx + 2ax - aa$. Compleat the Square, and it will be $xx - 2ax + aa = 2aa$.

Wherefore $x - a = \sqrt{2aa}$.

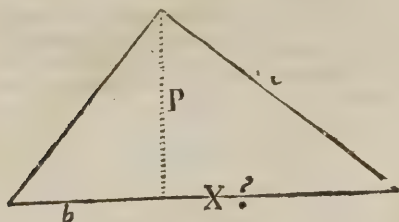
And consequently $x = \sqrt{2aa} + a = 14 \frac{1}{2}$.

PROBLEM III.

Given one Segment of the Base of a Right-angled Triangle, as also the Side of the Triangle Adjacent to the other Segment of the Base; 'tis required to find the rest, and to form the Triangle.

Suppose

Suppose it done; and let the Segment b , and the Side c , be both known or given. Let x , the other



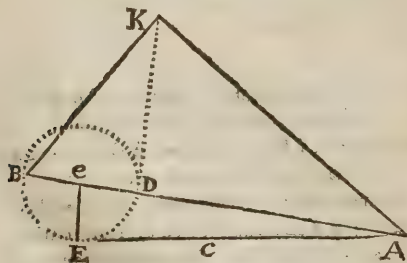
Segment of the Base, be sought; which is all that is necessary to solve the Problem.

Here therefore, since P is supposed to be a true Perpendicular;

- 1 $cc + xx = pp$. 47 e I Euclid.
- 2 And because the Angle at the Top is a Right one, therefore $pp = bx$, which gives another way of expressing pp . So that,
- 3 $cc - xx = bx$, and consequently by Transposition,
- 4 $cc = xx + bx$. which is an Affected Quadratick of the first Form. Wherefore,
- 5 $cc + \frac{bb}{4} = xx + bx + \frac{bb}{4}$ by completing the Square. And,
- 6 $\sqrt{cc + \frac{bb}{4}} = x + \frac{bb}{2}$, by Evolution.
- 7 Lastly, $\sqrt{cc + \frac{bb}{4}} - \frac{b}{2} = x$.

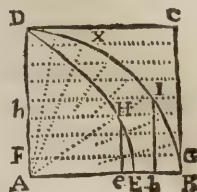
Geometrical Construction.

Join together at Right-angles $eE - \frac{1}{2}b$ and $EA = C$, Then with the Radius eE Describe the Circle BED , and thro' the Centre e Draw the Line AD . Erect then at D the Perpendicular DK ,



which Limit, by Describing a Semi-circle on BA , that Semi-circle shall cut the Perpendicular in the Point K , the Vertex of the Triangle required, whence draw the two Legs BK and KA . So is BKA the Triangle sought.

QUADRATRIX (in Geometry) is a Curve Line thus generated.



Let there be a Radius of a Circle, as AD , which imagine to move on the Centre A down the Circumference of the Quadrant DB , and at the same time let the Side of the Square CD move equally downwards, so that the Radius AD and the Side of the Square CD , may come to the Line AB together. Or let the Right Line DA , and the Quadrantal Ark DB , be both divided into a like Number of equal Parts, as in this Case they are each into 8. And to the Divisions of the Quadrant let as many Radii be drawn from the Centre A , and through the Divisions in AD as many Parallels to CD ; for then if a Curve Line be drawn neatly connecting the Points of Interfection of these Radii and Parallels, it will be that Line which is called the *Quadratrix* (as DE). From this Genesis of the Quadratrix arise these Corollaries.

1. That if through any Point, as H in this Quadratrix, you draw a Radius AHI , and the two Perpendiculars Hb and He , it will be, as the whole Quadrantal Ark DB , is to the Part IB :: so will the whole right Line DA be to the Part of it cut off bA , or its equal He , as is plain from considering the equal motion of the Radius AD , and the side of the Square DC , which intersect each other in H .

2. Wherefore any Ark of the Quadrant as IB , or any Angle as $IA B$, may by this Quadratrix be easily divided into 3 equal Parts, or any other Number at Pleasure, or according to any given *Ratio*, by only drawing the Radius AI , and then from the Point of the Quadratrix H letting fall the Perpendicular He : for if He be divided into 3 or any given Number of equal Parts, Lines drawn from A the Center through those Divisions, shall divide the Ark or Angle after the same manner. For as the parts of He , are to the whole Line :: so will the parts of the Ark IB be to the whole Ark: By the former Corollary,

3. I say, That the Base of the Quadratrix AE is a Third Proportional to the Radius AD , and the Quadrant BD .

For $DB : DA :: IB : He$, as follows (alternately) from Cor. 1.

And $IB : He :: bA : eA$, by the Triangles being Similar.

Now if you conceive the Ark IB to grow infinitely small, it must at last come to the same as its right Sine Ib , and both will coincide in the Point B ; and at the same time as HE and He coincide in the Point E , (by the Genesis of the Curve;) so that at last Ae and AE , Ab and AB will be coincident; And therefore at last $DB : DA :: IB$ (i. e. Ib)

(i. e. I b) H e. That is, as A b . A e . or which is the same at last, as A B (or A D) to A E.

Wherefore D B . D A :: D A : A E . Q . E . D :

4. Wherefore if on the Base of the Quadratrix A E, a Quadrantal Ark be described; it will be equal in length to D A the Side of the Square: And consequently the Semicircle will be double, and the Periphery Quadruple, of D A.

5. Hence may a Right Line be found equal to D B or any other Quadrant of a Circle, by only making as A E . A D :: A D to a Third Proportional, which will be equal to the Quadrantal Ark, by Cor. 3:

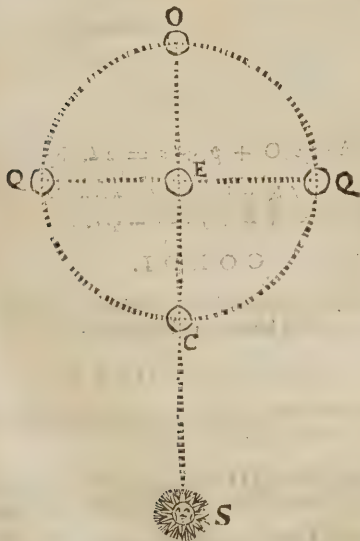
6. After the same manner may a Right Line be found equal to I B, or any other Ark of a Circle less than a Quadrant, if it be made as D A . H e :: D B . D B to a fourth Proportional by Cor. 1.

7. So that the Quadrature of the Circle, and the Trisection of an Angle might Geometrically be effected, if this *Quadratrix* were a true Geometrical Curve, as indeed it is not.

QUADRATURE of any Figure in Mathematics, is the Finding a Square equal to the Area of it. See *Lunes*.

QUADRATURE of the Parabola. See *Parabolic Space*.

QUADRATURES of the Moon, are the Middle Points of her Orbit, between the Points of Conjunction and Opposition: And they are so called, because a Line drawn from the Earth to the Moon, is then at Right Angles, with one drawn from the Earth to the Sun. When the Moon having been either in Conjunction with the Sun, at C, or in Opposition to him at Q, is come to Q, then she is in the Quadratures.



QUADRATUS *Femoris*, a Muscle of the Thigh, so called from its Figure; it ariseth broad and fleshy, from the *Apophysis* of the *Os Ischium*, and passes transversely with an equal breadth and thick-

ness to its partly fleshy; and partly Tendinous Insertion at the Posterior part of the *Os Femoris*, partly below the great *Trochanter*. This assists the *Marfupialis*, in turning the Thigh-bone outwards.

QUADRATUS *Genæ*, seu *Tetragonus*, is a great Square Muscle lying under the Skin of the Neck, and is spread over the whole inferior Region of the Face. It ariseth thin and membranous, from the Spines of the *Vertebrae*, the Skin on the Superior Part of the *Cucullaris*, and Pectoral Muscle, from hence ascending under the Skin of the Neck, becomes fleshy, and one part adhering to the *Os Hyoides*, is soon inserted to the Middle of the lower Jaw; the other broader portion proceeding farther to its Implantation in the Cheeks below the Angle of the Lips: It serves to draw down each Angle of the Mouth, together with the Cheeks, which Posture of the Face is the proper expression of Sorrow. But if the inferior Parts of these Muscles (which lie on the Neck) A& alone, they distend the Superincumbent Skin, by making it approach to a direct Line with the *Clavicula* and lower Jaw-bone, which otherwise is Indented according to the Formation of the Part, whereby a double Skin (as they call it) is represented.

QUADRATUS *Lumborum*, is a short thick, fleshy Muscle, situated in the Region of the Loins, or between the last Rib and Spine of the *Os Ilium*; it ariseth from the Posterior part of the Spine of the *Os Ilium*, and is inserted to all the Transverse Processes of the *Vertebrae* of the Loins internally, under the *Psoas* Muscle. This like the *Musculus Rectus Abdominis*, either moves the *Vertebrae* of the Loins nearer the *Os Ilium* laterally, when we are standing on both Legs firm, or else moves the *Os Ilium* nearer the said *Vertebrae* on the contrary side, when we stand upon one Leg only.

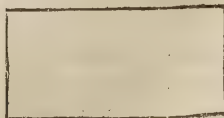
QUADRIGEMINI, according to some Anatomists, are four small Muscles that turn the Thigh toward the outside, and are placed upon the Articulation, or jointing of the Thigh one by another.

QUADRILATERAL Figures, are those whose Sides are four right Lines, and those making four Angles; and they are either *Parallelogram*, *Trapezium*, *Rectangle*, *Square*, *Rhombus*, *Rhomboides*.

Parallelogram, is a *Quadrilateral* Figure, whose opposite Sides are Parallel and Equal.



Trapezium, is a *Quadrilateral* Figure, whose Sides are unequal, as in this Figure.



Rectangle, is a *Parallelogram* whose four Angles are Right, and is also called a *Rectangled Parallelogram*.



Square, is a *Quadrilateral* Figure having its Angles Right, and the Sides all Parallel and Equal, as in the Figure.



Rhombus, is a *Parallelogram*, having its opposite Angles and all its Sides equal, as in this Figure.



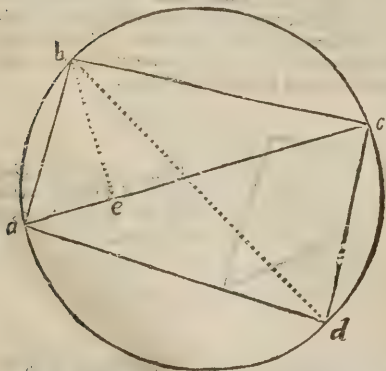
Rhomboides, is a *Parallelogram*, having neither its Angles nor Sides all equal.

PROPOSITION.

In a *Quadrilateral Figure* inscribed in a Circle (as $abcd$) the Rectangle under the two Diagonals (ac and bd) is equal to both the Rectangles made by the opposite Sides of the Figures $ab \times cd$, and $bc \times ad$.

That is, $ac \times bd = bc \times ad + ba \times cd$. Make the Angle $abe = \angle cbd$.

DEMONSTRATION.



1. The Triangles abd and bce will be similar, for $\angle bda$ is equal to the $\angle bca$, (being in the same Segment) and the $\angle abd = \angle ebc$, by the Addition of the common Angle ebd , to the two equal ones abe and dbc .

Then will $bc : ce :: bd : da$. and consequently $bc \times da = ce \times bd$. That is, the Rectangle under the opposite Sides $a d$ and bc , is equal to the Segment ec multiplied by the Diagonal bd .

2. The Triangles abe and cbd are Similar, because the $\angle abe = \angle cbd$ (by construction) and the $\angle bae = \angle bdc$, being in the same Segment.

Therefore $ae : ab :: cd : bd$.

Consequently $ae \times bd = ab \times cd$. That is, the \square under the remaining Segment ae , and the former Diagonal $bd = \square$ under the opposite sides ab and cd .

But $ac = ae + ce$.

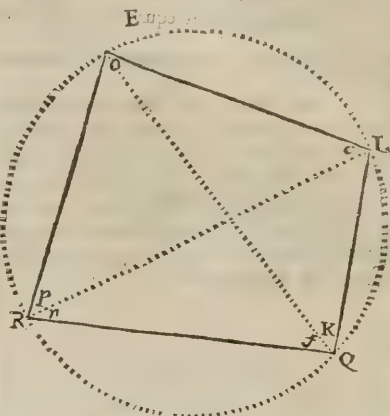
Wherefore $ac \times bd = bc \times ad + ac \times ab$.

Q. E. D.

PROPOSITION.

The opposite Angles of any *Quadrilateral Figure* Inscribed in a Circle, are always equal to two right ones.

I say $O + k + f = 2L$. Draw the Lines RL and EQ .



The Angles $O + p + c = 2L$, by the 32 e. 1.

But $\angle p = \angle k$, and $\angle c = \angle f$ per 21. e. 3.

Therefore $O + K + f = 2L$. q. e. d.

COROL.

Hence the external Angle of such a Figure, as $E = k + f$, the Internal and Opposite one.

For $O + e = 2L = O + k + f$.

Therefore take away O from both, and E will remain equal to $k + f$, q. e. d.

QUADRIPARTITION, is to divide by 4, or to take the fourth Part of any Number or Quantity.

QUADRUPLE, that is, Fourfold.

QUE Plura, was a Writ that lay, where an Inquisition had been made by an Escheator in any County, of such Lands or Tenements as any Man died seized of, and all that was in his Possession, was imagined not to be found by the Office: It differs

differs from the Writ called *Melius Inquirendum*, because this is granted, where the Escheator formerly proceeded by Virtue of his Office; and the other, where he found the first Office by virtue of the Writ named *Diem clausit extremum*.

QUÆ Servitia; see *Per qua Servitia*.

QUALE jus, is a Writ judicial, that lies where a Man of Religion hath Judgment to recover Land, before Execution be made of the Judgment; for this Writ must go forth to the Escheator, between Judgment and Execution, to enquire whether the Religious Person hath any Right to recover, or whether the Judgment be obtained by Collusion between the Demandant and the Tenant, to the intent that the true Lord be not defrauded.

QUALITY, signifies in the general the Properties or Affections of any Being, whereby it affects our Senses so and so, and acquires such and such a Denomination.

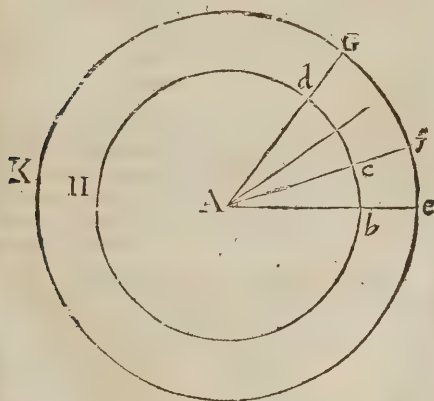
The Four *First Qualities*, as they are accounted by some, are *Heat, Cold, Moisture, and Dryness*.

The Four *Second Qualities*, or as they may be called, Chymical Qualities, are *Volatility and Fixity, Corrosiveness and Corrosibility*.

Sensible Qualities, are such as are the more Immediate Objects of our Senses.

Occult Qualities, were by the Ancients named such, of which no rational Solution in their way of according to their Principles could be given.

Mr. John Keill, in his *Introductio ad Physicam*, thus proves that all Qualities are *Remitted*, or have their Power or Efficacy abated, in a *Duplicate Ratio* of the distance from the Centre of the *Radiation*, or Exertion of the Quality.



Let A be a Centre from whence any Quality exerts itself round about, according to the right Lines *Ae, Af, AG, &c.* The Efficacy of the Quality, be it *Heat, Cold, Odour, &c.* will be (at equal Distances from A) as the *Spissitude* or Thickness of the Rays *Ab, Ae, Af.* But the Rays within the Inner Circle, or rather Spherical Superficies *bcdH*, when they come to be extended to the outer Spherical Surface, *efGK*, will be much less thick than before; and that in

proportion *reciprocally*, as the Spaces they take up: That is, if the outer Surface be double of the inner, the Rays there will be but half as thick: But since Spherical Superficies are as the Squares of their Radii, therefore the Efficacy of the Quality in the inner Surface will be to that of the outer, as *Ae* Square to *Ab* Square. *q. e. d.*

QUAM diu se bene gesserint, is a Clause often used in Letters-Patent of the Grant of Offices, as in those of the *Barons* of the *Exchequer*, which must be intended only as to Matters concerning their Office; and is nothing but what the Law would have implied, if the Office had been granted for Life.

QUANTITY, signifies whatsoever is capable of any sort of Estimation or Mensuration, and which being compared with another Thing of the same Nature, may be said to be *greater* or *less* than, *equal* or *unequal* to it.

Quantity may have these Four Divisions:

1. *Natural Quantity*; is what Nature furnishes us with in Matter and its Extensions, and in the Powers and Forces of natural Bodies; such as *Gravity, Motion, Light, Heat, Cold, Rarity and Density, &c.*
2. *Moral Quantity*, which depends on the Manners of Men, and the free Determination of their Wills; as the Prizes and Values of Things, Dignity and Power, Good and Evil, Merit and Demerit, Rewards and Punishments, &c.
3. *Notional Quantity*, arising from the Operation of the Understanding only; such as the Largeness or Smallness of the Mind's Capacity, and of its Conceptions: In *Logick, Universals, Predicaments*, and all such Terms: In *Grammar*, the *Quantity and Measure of Syllables, Accents, Tones, &c.*
4. *Transcendental Quantity*, as *Duration*, the Continuation of any Being's Existence, *Time, &c.* Quantity is divided also into *Continued* and *Discrete*, which see:

The *QUANTITY* of Matter in any Body, is its Measure arising from the joint Consideration of its Magnitude and Density: As if a Body be twice as Dense, and take up twice as much Space as another, it will be four Times as great. And this Quantity of Matter is best discoverable by the Weight of Bodies, which Sir *Is. Newton* found by his Nice Experiments on Pendulums, so exactly proportional to the Matter of Bodies. *Newton. Princip.*

The *QUANTITY* of Motion in any Body, is its Measure arising from the joint Consideration of Quantity of Matter in, and the Velocity of the Motion of that Body. For the Motion of any Whole is the Sum or Aggregate of the Motion in all the several Parts: And tho' in a Body twice as great as another, moved with an equal Velocity, it will be double; yet if the Velocity be double also, the Quantity of the Motion will be *Quadruple*. *Newton. Princip.*

In *Philosophical Transactions*, Numb. 195. is an Account by the Learned Captain *Halley*, of the several Species, or Kinds of *Infinite Quantity*.

Where he proves, That besides *Infinite Length*, and *Infinite Area*, in which there are great Varieties;

There are also no less than three sorts of *Infinite Solidity*. See *Infinite Quantities*.

QUANTUM Meruit, is an Action of the Case so called, grounded upon a Promise to pay a Man for doing any Thing, so much as he should Deserve, or *Merit*.

QUARE ejecit infra terminum; is a Writ that lieth for a Lessee, where he is cast out of his Farm, before his Term be expired, against the Feoffee or Lessor that ejecteth him: And it differs from *Ejecti-one firma*, because this lieth where the Lessor, after the Lease made, infeoffeth another, which ejecteth the Lessee: And the *Ejectione firma*, lieth against any other Stranger that ejects him, But the Effect of Both is all one; that is, to recover the residue of the Term.

QUARE Impedit, is a Writ that lies for him that hath purchased a Manor with an Advowson thereto belonging, against him that disturbs him in the Right of his Advowson, by presenting a Clerk thereto, when the Church is void: And it differs from the Writ called, a *Darrein presentment*, *Assisa ultima presentationis*, because that lies where a Man, or his Ancestors formerly presented: and this for him that is the Purchaser himself: Note, That where a Man may have an *Assise Darrein Presentment*, he may have a *Quare impedit*, but not contrariwise.

QUARE Incumbavit, is a Writ that lieth against the Bishop who within six Months, after the Vacation of a Benefice, conferreth it upon his Clerk, while two others are contending in Law for the Right of Presenting. This Writ always lies depending the Plea.

QUARE intrusit Matrimonio non satisfacto, is a Writ that lies where the Lord proffers convenable Marriage to his Ward, and he refuses, and enters into the Land, and Marries himself to another; then the Lord shall have this Writ against him. But all Wardships being taken away by the Statute 12 Car. 2. cap. 24. this Writ is become useless.

QUARE non admittit, is a Writ that lies against a Bishop, refusing to admit his Clerk that hath recovered in a Plea of *Advowson*.

QUARE non permittit, is a Writ that lies for one that has Right to present for a Turn, against the Proprietary.

QUARE obstruxit, is a Writ that lies for him who having Liberty to pass through his Neighbours Ground, cannot enjoy his Right, for that the Owner has so Strengthened it.

QUARENTINA habenda, is a Writ that lies for a Widow to enjoy her *Quarentine*.

QUARENTINE, is a Benefit allowed by the Law of England, to the Widow of a Man Dying Seized of Land; whereby she may challenge to continue in his Capital Messuage or chief Mansion-house (so it be not a Castle) by the Space of Forty Days after his Decease, and if the Heir, or any other attempt to eject her, she may have the Writ *de quarentina habenda*.

QUARTATION, is a way of Purifying of Gold, used by Refiners who melt three Parts of Silver with one of Gold (whence the Name) and then cast the Mixture into *Aqua fortis*, which will dissolve the Silver, and leave the Gold in a blak Powder at the Bottom.



QUARTER in Heraldry, signifies a Partition made of just a fourth Part of the Field, by Two Right Lines, thus;

He beareth *Argent*, a *Quarter Gules*.

QUARTER of a Ship, is that Part of the Ship's Hull which lieth from the Steerage Room to the Transom.

QUARTER-deck. See *Deck*.

QUARTER, in a Military Sense, sometimes is used to signify the good Treatment given to a vanquish'd Enemy: Thus say they, *The Enemy asked Quarter*; *We gave no Quarter*, &c.

QUARTER signifies the Ground a Body of Men is Encamp'd upon; as when they say, Such a Quarter is well fortify'd; and oftentimes the Troops themselves that are there Quartered; for they say also, *We beat up the Enemies Quarters*.

QUARTERS (Winter). Winter Quarters sometimes is used for the Interval between two Campaigns, but more generally for the Place or Places where Troops are lodged during the Winter.

QUARTERS of Refreshment, are such Places as Troops which have been much fatigued and harassed, are put into, to recover their Strength or Health, during some time of the Summer or Season of the Campaign.

QUARTER-Master, in the Land Forces, is either the Quarter-Master General of an Army, who is to see out for good Quarters for the whole; or of any Regiment of Foot, or Troop of Horse; whose Office it is to do the same for those Bodies.

QUARTER-Master, is an Officer Aboard a Ship (of which there are more or fewer according to her Burthen) whose Business is to rummage in the Hold on all Occasions, to overlook the Steward in this Delivery of Victuals to the Cook, and in his Pumping and Drawing out the Beer; and in general to take care there be no Waste: He is also to mind the Ship's Loading, in which he is usually employed.

QUARTER at a Siege, is an Encampment upon one of the most principal and important Passages round about the Place besieged, to prevent Relief and Convoys: This is either commanded by the General of the Army, and then is called, the General's Quarters, or by a Lieutenant-General.

QUARTERING, is spoken of a Ship when she sails upon a Quarter Wind: 'Tis also spoken of a Piece of Ordnance, when 'tis so Traversed that it will shoot on the same Line, or on the same Point of the Compass, as the Ship's Quarter bears.

QUARTERS in a Clock, or Movement, are little Bells which sound the Quarters, or other Parts of an Hour. The Way of making any Clock strike them, see in *Watch-Work*.

QUARTILE, is an Aspect of the Planets, when they are 3 Signs, or 90 Degrees distant from each other, and is marked thus □.

QUAVER, a Note in Musick so called: See the Words *Notes* and *Time*.

QUE Estate, in common Law, signifies a Plea, whereby a Man Entitling another to Land, &c.

Latin,

faith, That the same Estate he had, he hath from him.

For Example: In a *Quare Impedit*, the Plaintiff alleges, That such four Persons were seized of Lands whereunto the Advowfor in question was appendant in Fee, and did present to the Church, and afterwards the Church became void, *Que estate del*, &c. that is, *Which Estate* of the four Persons he has now during the Vacation, by Vertue whereof he presented, &c.

QUE est Mesme, a Law Term used in an Action of Trespass, or such like, for a positive Justification of the very Act complained of by the Plaintiff, as a Wrong.

For Example: In an Action upon the Case, the Plaintiff says, That the Lord threatned his Tenants at Will, in such sort, that he forced them to give up their Tenures. The Lord, for his Defence pleadeth, That he said unto them, That if they would not depart, he would sue them at Law: This being the same Threatning that he used, or to speak Artificially, *Que est le Mesme*, The Defence is good.

Queüe d'yronde, a Term in Fortification, being what we call Swallows Tail; and signifies a Detached or Out-work, whose Sides open towards the Head, or Campaign, or draw narrower or closer towards the Gorge. Of this kind are either single or double Tenailles, and some Horn-works, whose Sides are not parallel, but are narrow at the Gorge and open towards the Head; like the Figure of a Swallow's Tail.

When these Works are cast up before the Front of a Place, they are defective in this Point, that they do not sufficiently cover the Flanks of the opposite Bastions, but then they are very well Flanked by the Place, which covers all the length of their Sides the better.

QUEM redditum reddit, is a Writ Judicial, that lies for him to whom a Rent-seek, or Rent-charge is granted, by Fine levied in the King's Court against the Tenant of the Land that refuseth to Attorn to him, thereby to cause to Attorn.

QUENE, as the Heralds write it, (but it should be *Queüe*) the Word in Blazon for a Tail of a Beast, thus: If a Lyon have a forked or double Tail, they say he is *Double Quened*.

QUERELA, an Action preferred in any Court of Justice, in which the Plaintiff was *Querent*, or Complainant, and his Brief, Complaint, or Declaration, was *Querela*.

QUERELA freshe fortice, is a Writ of *Fresh-force*; which see.

QUERELA coram Rege & concilio discutienda & terminanda, is a Writ whereby one is called to justify a Complaint of a Trespass, made to the King himself, before him and his Council.

QUERENS non invenit per legum, is a Return made by the Sheriff upon a Writ directed to him, with this Condition inserted, *Si A. fecerit B. securum de clamore suo prosequendo*.

QUEST, or *Inquest*, an Inquisition or Enquiry made upon Oath of an Impannell'd Jury.

QUEST-Men. See *Sidemen*.

QUESTUS, or *Quæstus*, in Law, is taken for that Land which does not descend to us by Hereditary Right, but is gain'd by our own Labour and Industry: this is called *Purchased Lands*.

QUESTUS est nobis, is the Form of a Writ of *Nuisance* which lies against him to whom the House,

or other thing, that breeds the *Nuisance*, is alienated.

QUIA improvide, is taken to be a *Super sedens* granted in the behalf of a Clerk of the Chancery, sued against the Privilege of that Court in the Common-Pleas, and pursued to the *Exigent*, or in many other Cases, where a Writ is erroneously sued out.

QUID juris clamat, is a Writ Judicial, issuing out of the Record of the Fine, which remaineth with the *Custos brevium* of the Common-Pleas, before it be engrossed; and it lies for the Grantee of a Reversion or Remainder, when the particular Tenant will not Attorn.

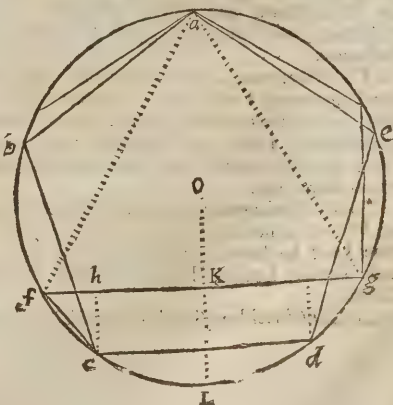
QUID pro quo, in Law is used for the Reciprocal Performance of both Parties to a Contract, and thereupon the giving of one thing of a Value for another thing of like Value, as 10*l*. for a Horse, &c.

QUIETUS, is a Word used by the Clerk of the Pipe, and Auditors in the Exchequer, in their Acquittances or Discharges given to Accomptants, usually concluding with an *abinde recessit quietus*, which is called a *Quietus est*, and mentioned in the Act of General Pardon, 12 Car. 2. 11. and 14 Car. 2. Cap. 21. A *Quietus est*, granted to the Sheriff, shall discharge him of all Accounts due to the King.

QUINCUNX, that Position, or Aspect, that the Planets are said to be in, when distant from each other 150 Degrees, or 5 Signs, and is mark'd thus, *Vc. or Q.*

QUINDECAGON, is a plain Figure of 15 Sides and Angles, which if they are all equal to one another, is called a Regular Quindecagon; which how to describe in a Circle, *Euclid* shews Prop. 16. e. 4th

The Side of a Regular Quindecagon, so described, is equal in Power to the half Difference between the Side of the Equilateral Triangle, and the Side of the Pentagon, and also to the Difference of the Perpendiculars let fall on both Sides, taken together.



Make the Pentagon *abcde*, and parallel to any one Side of it, set the Base of the Equilateral Triangle *fga*. Then (by 16. e. 4 *Eucl*) will *fo* be the Side of the Quindecagon, *fb* = $\frac{1}{2}$ the Difference between the Side of the Triangle and Pentagon; and *bc* = to the Difference of the Perpendiculars

pendiculars let fall from the Centre *o*, to both the Sides of the Figures.

But $\square f c = \square f b + \square b c$; by 47 *e. Euclid*. Wherefore the Proposition is true, *Ecce*.

QUINQUEANGLED, in Geometry, is a Figure consisting of five Angles.

QUINSIE, or rather *Squinancy*, a Disease so called. See *Angina*.

QUINTESSENCE, is a Medicine made of the Energetical and Active Particles of its Ingredients, separated from all Fæces or Dregs.

QUINT *Exact*, in Law, is the last Call of a Defendant, who is sued to the Outlawry, where, if he appear not, he is by the Judgment of the Coroners returned *Outlawed*; if a Woman, *Waved*. See *Exigent*.

QUINTILE, an Aspect of the Planets when they are 72 Degrees distant from one another, and noted thus, *C* or *O*.

QUINTUPLE, Five-fold or five times as much as another thing.

QUITE *Claim*, is a Release or Acquitting of a Man from any Action he hath, or might, or may have against him.

QUIT *Rent*, is a certain small Rent, payable yearly, by the Tenants of most Mannors; upon the payment whereof they are to quit, till it becomes due again.

QUO *Jure*, is a Writ that lies for him that has Land, wherein another challengeth *Common of Pasture*, Time out of Mind: And it is to compel him to shew by what Title he Challenges it.

QUO *Minus*, is a Writ that lies for him that hath a Grant of Houfe-bote and Hey-bote in another Man's Woods, against the Grantor, making such Waste as the Grantee cannot enjoy his Grant. This Writ lies also for the King's Farmer in the Exchequer, against him to whom he selleth any thing by way of Bargain touching his Farm, or against whom he hath any Cause of Personal Action: For he supposeth by the Vendees detaining any Due from him, he is made *less able* to pay the King's Rent; and under this pretence; any one who pays the King a Fee-Farm Rent, may have this Writ against any other Person, for any Debt or Damage, and bring the Cause to Trial in the Exchequer.

QUO *Warranto*, is a Writ that lies against him that Usurps any Franchise or Liberty against the King; as to have Waife, Stray, Fair, Market, Court-Baron, Leet, or such like, without good Title: Or else against him that intrudeth himself as Heir into Land.

QUOD *Clerici noneligantur in Officio Ballivi, &c.* is a Writ that lies for a Clerk, which by reason of some Land he hath, is made; or in doubt to be made Bayliff, Beadle, Reeve, or some such like Officer.

QUOD *Clerici beneficiarii de Cancel*, is a Writ to

exempt a Clerk of the Chancery from Contribution towards the Proctors of the Clergy in Parliament.

QUOD *ei deforeat*, is a Writ that lies for the Tenant in Tail, Tenant in Dower, or Tenant for Term of Life, having lost by Default against him that Recovered, or against his Heir.

QUOD *permittat*, is a Writ that lies for the Heir of him that is disseised of his Common of Pasture, against the Heir of the Disseisor being Dead.

QUOD *Persona nec Prebendarii, &c.* is a Writ that lies for Spiritual Persons that are distrained in their Spiritual Possessions, for the Payment of a Tithteenth with the rest of the Parish.

QUOILE, or *Coile*, at Sea; is spoken of Cables or Ropes, when they are placed in a round or Oval Ring one *Fake* (or Turn) upon another: that so they may the more easily be stowed out of the way, and also run out free and smooth, without *Knecks* or *Keuks* as they call them; *i. e.* without Twistings or Doublings: Then the Cable is said to be *Quoiled* up.

QUOIN, a Sea Word, the same with *Coin*; which see.

QUORUM, a Word often used in our Statutes; as also in Commissions, both of Justices of the Peace, and others. As for Example, where a Commission is directed to seven Persons, or to any three of them, *wherof* A. B. and C. D. to be two, there A B C D. are said to be of the *Quorum*, because the rest cannot proceed without them: So a *Justice of the Peace*, and *Quorum*, is one, without whom the rest of the Justices, in some Cases cannot proceed.

QUOTIDIAN *Ague*, is that, whose Fits return every Day.

QUOTIENT, is that Number in Division which arises by dividing the Dividend by the Divisor: And is called Quotient, because it answers to the Questions *Quoties?* Or how often one Number is contained by another?

Thus:

If 360 be to be divided by 24, the Quotient will be 15, and the Numbers will stand thus:

24) 360 (15.

Where 15 is the Quotient.

QUOYLE, a Sea Word: They say a Cable is *Quoyled*, when 'tis laid round in a Ring on the Deck, or Floor of a Ship; in the middle of which Ring, or *Quoyle*, is a good Place to lay Shot in; which is more safe there than in Lockers along the Side; for there the Enemies Shot may fall into it, and beat it about among the Men.

RABANET. See *Rabinet*.

RABBETTING in a Ship, is the letting in of her Planks to the *Keel* which in the *Rake* and *Ruh* of the Ship, is hollowed away, that the Planks may join the better and closer, and this hollowing away, is called the Rabber of the Keel.

RABDOIDES, the same that *Sutura sagittalis*.

RABINET, a sort of Ordnance, whose Diameter at the Bore is $1 \frac{1}{2}$ Inches, Weight 300 Pound; Length 5 Foot, Load $\frac{1}{2}$ of a Pound, Shot something more than an Inch and a quarter Diameter, and $\frac{1}{4}$ a Pound Weight.

RACHITÆ, and *Rachiai*, are Muscles belonging to the Back; so called by some Foreign Anatomists, and seem to be the same with what we call *Semispinati*.

RACHITIS. See *Rhachitis*.

RADIALES Internus & Externus, are Muscles of the Wrist, the one serves to bend it, and the other to extend it. *Blanchard*.

RADIATION, signifies the casting forth of Beams, or Rays of Light; and in Opticks it is considered as threefold, viz. *Direct*, *Reflected*, and *Refracted*. See *Ray*.

RADICAL Moisture, is a Term used by some, for the Fundamental Juice of the Body, which they will have to nourish and preserve the natural Heat, as the Oil in a Lamp preserves and feeds the Flame. *Blanchard*.

RADICLE, a Word used by Botanists, to denote that Part of the Seed of a Plant, which upon its Vegetation becomes its Root: This in Corn is that which Masters upon its shooting forth, call the *Cume*. 'Tis not easily to be discerned in many Seeds, by the naked Eye: but in that of Fenugreek, 'tis as big as one of the Lobes: And in the Garden-bean it appears visible on the Separation of the Coats, it is of a White Colour, more Glossy than the Main Body, and stands at the greater End without the Lobes: Therefore this End in setting Seeds, should always be placed lowermost.

RADIUS, in Geometry, is the Semi-diameter or half the Diameter of a Circle: See under the Word *Circle*.

RADIUS, is the left Bone of the Cubit, called *Focile minus*; it is more oblique than the great Bone, called *Ulna*, and is distant a little from it in the middle, where there occurs a small Ligament above the *Ulna*, which receives the *Radius*, and below the *Radius* receives it. The upper Part of the *Radius* is jointed with the outward Process of the Arm by *Diarthrosis* (which see); the lower by way of Appendix with the Wrist Bone, at the Middle Finger. It's upper end is small, and the lower thick. The greater Bone of the Leg also is called *Radius*. *Blanchard*.

RAGGULED, the Heralds Term for any Ordinary, *Ex. gr.* a Cross whose out Lines are of this Form.

He beareth *Sable*, a Cross *Ragguled Or.* by the Name of *Stoway*.

This differs from Indented, because that is regular, and this is not so, but rather ragged.



RAINBOW or *Iris*: the very Learned and Ingenious Mathematician, Mr. *Edward Halley*, in a Discourse de *Iride* in *Phil. Transact.* No. 267, gives the best Account that we have ever had, of the Cause of the various Colours of the Rainbow, and the Solution of their several Phenomena. He tells us there, that the Ingenious *Des Cartes* was the first, that by applying Mathematicks towards the Investigation of this surprizing Appearance, ever gave a Theory of the *Iris*: And he found the Laws of Refraction, which the Lucid Rays suffer in passing thro' any Diaphanous Bodies: And clearly demonstrated the *Primary Iris* to be only the Sun's Image, reflected from the Concave Surfaces of an Innumerable Quantity of small spherical Drops of falling Rain: With this necessary Circumstance, that those Rays, which fell on the Objects, Parallel to each other, should not after one Reflection, and two Refractions, (viz. At going into the Drop, and coming out again) be dispersed, or made to Diverge, but come back again also to the Eye, parallel to each other.

He shewed also, that the Colours, in the Rays of Light were produced by those Refractions as they are by passing through a Triangular Glass Prism. The *Secondary Iris*, he supposes produced by those Rays of the Sun, which fall more Obliquely, but after the same Manner as before, only in these there are two Reflections, before the Sun's Rays refracted a second time, and tending towards the Eye, in a parallel Position, can get out from the Aqueous Globules. The Magnitude of the *Iris*, he makes to depend on the Degrees of Refraction; which is different, in different Liquors, or Transparent Solids: But supposing the Ratio of the Sines of Incidence, to those of the refracted Angles, to be in Water as :: 250. to 187, he determined thence the Semi-diameter of the *Iris*, near enough to Observation, viz. The Primary one to be 41 Degrees 30 Minutes, and the secondary one to be 51 Degrees 54 Minutes. See the 8 Chap. of his *Met*-

teors. Mr. *Halley* observes, that *Des Cartes* using only a Tentative and Indirect Method, in determining his Angles, seems not to understand the Easiness of solving his own Problem.

Wherefore because hardly any one hath written well on this Subject, since *Des Cartes*, he shews you there how to determine the Angle, by which the *Iris* is distant from the opposite Point of the Sun; and the Ratio of the Refraction being given Geometrically, or *vice versa* the *Iris* being given, to determine the Refractive Power of the Liquor.

And first he saith, It is plain from *Des Cartes*'s Demonstrations, That the *Primary Iris* is made by the Sun's Rays, where the Excess of the two Refracted Angles above the one of Incidence, is the greatest possible.

And the *Secondary Iris* is formed by those Rays, where the Excess of three Refracted Angles above one of Incidence, is also the greatest possible.

And thus you may go on to 3, 4, 5, or 6 *Iris*'s, which will all be formed where the Rays Emerge out of the Watery Cloud after 3, 4, 5, or 6 Reflections; but none but the Second will be ordinarily visible in the Heavens, because the Rays of the Sun

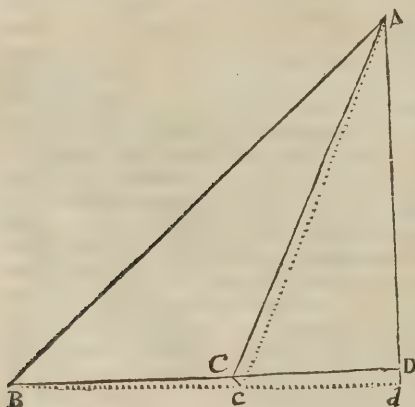
Sun grow at last very much attenuated and weakened.

Now if you double this greatest possible Excess of the refracted Angles above that of Incidence, (if the Number of Reflections be odd) it will give the Distance of the Iris from the Point opposite to the Sun.

But if the Number of Reflections be even, then the double of the greatest refracted Angle, will be the Distance of the Iris from the Sun himself.

Now to gain these Greatest Excesses, having the Refraction of any Liquor, or the Ratio of the Sine of the Angle of Incidence to the Sine of the refracted Angle, you must observe, that the Excess of two refracted Angles, above one of Incidence, will be Greatest where the Momentaneous Augment or Fluxion of the Angle of Incidence, is precisely double to the Momentaneous Augment of the the refracted Angle. And if there be three refracted Angles, the Greatest Excess will be where the Momentaneous Augment of the Angle of Incidence is Triple of the Moment of the refracted Angle, and so on, which is sufficiently evident.

But in order to find the Angles themselves, Mr. Halley premises the following Lemma.



Let there be a Triangle ABC, whose Vertex is at A; its Legs BA and CA, and the Base BC; on which produced, let fall the Perpendicular AD. Then let the Vertical Angle BAC be supposed to be increased by a Quantity infinitely small, as suppose by the Moment CAc: Then drawing the Lines BCc, and cD, they will be only imaginarily different from BCD and CD.

This done, I say, That if the Legs of the Plane Triangle BAC, (or any other) continuing the same, the Vertical Angle be imagined to be encreased by any infinitely small Moment or Fluxion, then will the Moments of the Angles at the Base, be reciprocally as the Segments of the Base: That is, CBc, is to the Moment of the Angle ACB, or ACD :: as CD is to BD.

For since the external Angle ACD = to ABC + Angle BAC, its Moment must also be equal to the Sum of their Moments, or to CBc + CAc: but now because the Triangle ACD is right-angled at D, AC may be the Diameter of a Circle, whose Periphery will pass through A, D, C, and c, and consequently the Angles CAc, CDc being in the same Segment are equal. So that the Sum of the two Fluxionary Angles CBc, and cDC

(i.e. the external Angle Dcd) will be the Moment of the Angle ACD, or ACB. But those CBc, and Dcd, being infinitely small, will be to each other, as the Sides opposite to them, or as cD or CD is to BD: That is, reciprocally as the Segments of the Base. Q. E. D.

If B and C had been both Acute, the way of Proof is the same, all Things considered.

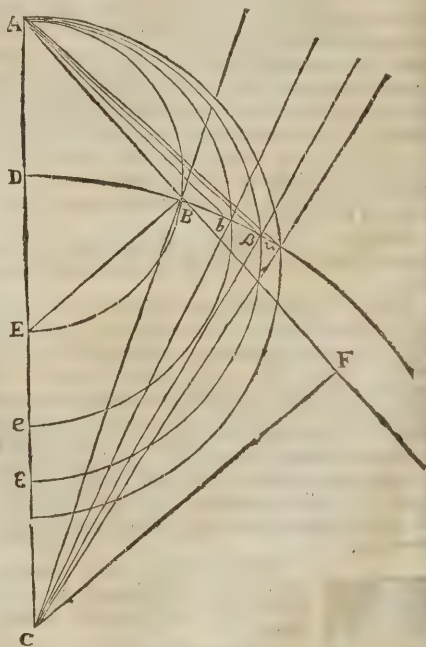
COROLLARY.

Hence it follows, That the Moments of the Angles at the Base, are to one another directly as the Tangents of these Angles.

By the help of this Lemma he shews how to obtain the Diameter of any Iris, either Geometrically, or by Calculation.

Let there be any Right Line as AC, and let it be so divided in D, that CA may be to CD :: according to the Ratio of Refraction; that is, in Water :: as 250 is to 187, or more nicely :: 529 is to 396. Then let it be divided again in E, so that CE shall be to AE :: as Unity is to the Number of Reflections which the Solar Rays must undergo in producing the Iris proposed: This done; on the Diameter AE let the Semicircle ABE be described; and on the Centre with the Radius CD, draw the Ark BD, cutting the Semi-circle ABE in the Point B. Then drawing the Right Lines CB, AB, let the Perpendicular CF, be let fall on AB produced to F; and to that Perpendicular draw the Parallel EB.

I say the Angle CBF is the Angle of Incidence, CAB is the refracted Angle, both required for the producing the proposed Iris.



DEMONSTRATION.

Since the Triangles ACF, AEB are Similar, AF will be to BF :: as AC to EC :: that is, as the

the Number of Reflections augmented by Unity, is to Unity; by the Construction.

Wherefore the Moment of the Angle CBF, is to the Moment of the Angle CAF in the same Ratio, by the Lemma.

But the Sine of the Angle CBF, is to the Sine of the Angle CAF:: in the Ratio of their Sides CA, CB: That is, in the Ratio of the Refraction given.

By the Construction also, the Angle of Incidence RBF, hath its corresponding Refracted Angle RAF: Wherefore since their Moments are in the Ratio proposed, those are the Angles sought or required. Q. E. D.

Now therefore multiplying the Refracted Angle by the Number of Reflexions augmented by Unity, and from the Product Subtracting the Angle of Incidence, you will have half the distance of the *Iris* from the Sun, if the Number of Reflexions were even; but if they were odd, from the opposite Point of the Sun, as was said before.

And from hence, by a very easy, short, and elegant Construction, he shews how to exhibit to the Eye, the Incidences of all manner of *Iris's*, as they will appear in any Liquor whose Refraction is given. For, if the Line A C in the last Figure, bisected in E, have a Third part cut off from it in *e*, a Fourth part in E, a Fifth part in *n*, &c. And then there be Semicircles described on the Diameters AE, A *e*, AE, A *n*, &c. all which shall be cut by the Circular Ark D B b, and *v*, described on the Centre C with the Radius CD, (which Radius CD is to AC in the Ratio of the given Refraction) in the Points B *b*, B *v*, &c. I say, the Lines AB, A *b*, AB, A *v*, shall make with the Line AC, Angles equal to the refracted Angles, and with the Radii CB, C*b*, CB, C*v*, respectively Angles equal to those of Incidence required; that is, ABC (or rather its Complement to a Semicircle) for the *Primary Iris* A b C for the Secondary one, ABC for the Third, and A v C for the Fourth, &c. and so on as far as you please.

He shews also, that the Reader, if skill'd in Algebra, may easily find these Angles by Accurate Calculation, derived from the same Fountain: Thus, Let the Radius be = 1. and the Ratio of Refraction, as *r* to *s*; then will the Sine of Inci-

dence be $\sqrt{\frac{4}{3}} - \frac{1}{2} \frac{r}{s}$ but the Sine of the Re-

fracted Angle will be $\sqrt{\frac{4}{3}} \frac{SS}{rr} - \frac{1}{2}$; from which Angles the *Primary Iris* will be found.

For the Second *Iris* $\sqrt{\frac{2}{3}} - \frac{1}{2} \frac{r}{s}$ will be the

Sine of Incidence; and $\sqrt{\frac{2}{3}} \frac{SS}{rr} - \frac{1}{2}$ will be the Sine of the refracted Angle. And so on, as he further shews.

And if you proceed to Calculate according to D. Cartes his Proportion, the *Primary Iris* will be distant *ab Opposito Solis* 41° 30', the Secondary one 51° 55'. But the Third and Fourth will be distant 40° 20', and 45° 33' from the Sun himself; but probably no one can ever see either of these, for the reasons above given.

As to the Colours with which this wonderful Bow is adorned, he observes, That our most Sa-

gacious Sir *I. Newton* was the first who shewed by most plain Experiments, that the Rays of Light do not come uniform and simple out of the Luminous Body; but that the pure white Light which we see, is compounded of the Corpuscles of all manner of Colours, blended one with another, by the most rapid Motion; and, That the Colours of all Bodies arise from their different Disposition to refract or reflect some peculiar Species of Light. This is principally proved from *Refractions*, by which these distinct Species are separated one from another; for Blue or Purple Light is, for Instance, more refracted in passing through a Diaphanous Body, than Yellow or Red. See the Words *Light and Colours*, where I have given you a large Account of Sir *I. Newton's* Experiments, as mentioned in his Letter in the *Phil. Transf.* N. 80, &c.

It being therefore certain that all kind or degrees of blue Light, are a little more refracted than any reddish Light whatsoever, 'Tis plain, saith Mr. *Halley*, that from this difference the breadth of the *Iris* must arise; but which, is hardly to be determined by Observation, by reason of the uncertain Limits of the Colours in the Clouds. But the greater the Ratio of Inequality between CA and CD, or the greater the Refraction is, by so much the greater will the Distance be of any *Iris* from the Sun; so that those which are more remote from the Sun, are always more adorned with a Purple Colour, but the more near ones with a Red one, as is apparent in the *Primary Iris*, which vanishes or disappears in *Opposito Solis*, if the Sine of Incidence to that of the refracted Angle be as CA to CE:: or as 2. to 1. And if the Ratio be greater than this, the *Primary Iris* will not be at all visible, or no *Primary Iris* at all can be seen.

It is to be observed also, That the *Secondary Iris* will go off in a Point, in *Opposito Solis*, whenever the Ratio of Refraction is as 1. to $\sqrt{2} + \sqrt{2}$ or as 1 to 0.837487. And from thence will turn back towards the Sun himself, and there disappear, if the aforesaid Ratio be as 2 to 1, or as CA to C*e*.

But in the Intermediate Proportions, (which are found in all known Fluids, except Air) the greater the Ratio of Refraction, the further is the *Iris* distant *ab Opposito Solis*, or rather from the Sun himself, the Ark being numbered beyond the Semicircle, and therefore the Colours will appear to be found in an Order diverse from that in the *Primary Iris*, unless you thus reckon the distance of the *Secondary* one from the Sun himself, which must also be taken notice of in the other *Iris*.

The Third *Iris* in *Opposito Solis* is quite confused; the Ratio of the Refraction being as 1 to 91855, and from thence it runs back in the Ratio of 1 to 68250; from whence again, the order of the Colours being restored, in the Ratio of 4 to 1, or of CA to C*e*, it ends in *Opposito Solis*.

But the Fourth *Iris* beginning from the Sun in the Ratio of Equality, passes off in the Points opposite to him in the Ratio of 1 to 94895, and thence returns to the Sun again, if the Ratio be as 1 to 4; and from thence is again dispersed or scattered towards the Parts opposite to the Sun, in the Ratio of 1 to 56337, within which Bounds are the Refractions of all known Fluids contained.

Lastly, if the Ratio were as 5 to 1, or as CA to C*n*, the *Iris* will vanish into the Sun himself; and the Colours to appearance will be inverted at

its Regress to the Sun, as they were right or direct at their Egress.

And from hence it is that the Primary and Fourth Iris in Watry Clouds obverts a reddish Colour towards the Sun, but the Secondary and Third, a Purple one.

After this, Mr. Halley shews how, having the Distance of the Iris from the Sun, to find the Ratio of the Refraction; and this by a very easy, but most accurate Observation.

Take a small Glass Tube, and erecting it perpendicular to the Horizon, suspend in its lower Orifice a small drop of Water, or some such clear Fluid; and then at some time when the Sun is near the Horizon, and shines very bright, let it be observed under what Angle *cum Opposito Solis*, the Colours of the Iris are seen in the pendulous drop; for then the Ratio of the Refraction may be had by an easy Calculation. And its Investigation forms a Cubick Equation, having only one Root, by which the Primary Iris being given, the Ratio may be found. The Equation is this, $T^3 - 3T^2t - 4trr = 0$. In which, T is the Tangent of the Angle of Incidence sought, and t is the Tangent of half the Distance of the Iris *ab Opposito Solis*, to the Radius $r = 1$. Whence, according to Cardan's Rules, there arises this Theorem, *viz.*

From the Cube t, let there be taken the Product of $2tr$ into the Excess of the Secant of the same Ark above the Radius, the remainder of difference shall be the lesser Cube: But the Sum of them, adding $4trr$ shall be the greater Cube. The Sum of the Sides of both Cubes added to t, will be equal to the Tangent of the Angle of Incidence; and the half of that Sum, the Tangent of the refracted Angle. Whence the *Ratio* of the Refraction is known.

Of this he gives the following Example.

In a drop of Oil of Turpentine, the distance of the Primary Iris *ab Opposito Solis*, was observed to be $25^{\circ} 40'$.

The Ratio of the Refraction was required.

$$\begin{aligned} t &= \text{Tangent } 12^{\circ} 50' = 0.2278063 \\ s &= \text{Secant of the same} = 1.0256197 \\ ttt &= 0.01182217 \\ s - r \text{ into } 2rt &= 0.01167265 \end{aligned}$$

Difference, Cube of the less 0.00014952 whose

$$\begin{aligned} \sqrt[3]{0.053773} & \\ \text{The Sum} &= 0.02349482 \\ \text{Adding } 4trr &= 0.91122525 \end{aligned}$$

The Cube of the greater 0.93472007 whose

$$\begin{aligned} \sqrt[3]{0.9777486} & \\ t &= 0.2278063 \end{aligned}$$

1.2586322 = Side of the Cube of lesser. = T The natural Tangent of the Angle of Incidence $51^{\circ} 32'$ and its Half,

viz. 0.6293161 is the natural Tangent of the Refracted Angle, *viz.* $32^{\circ} 11'$.

Lastly, as $\sqrt{T^2 + 4} : \sqrt{T^2 + 1} :: r.s.$ or so, is 1 to 68026. Which Ratio comes very near to that which by Experiment is found to be in Glass and most diaphanous Solids.

Only, indeed, a Diamond exceeds the rest of Pellucid Stones, in this Power of Refraction; for

its Ratio is nearly as 5 to 2, or more accurately, as 100 to 41. See Vol. 2.

RAKE of a Ship, is so much of her Hull as overhangs at both ends of her Keel. That part of it which is before, is called her *Rake forward on*; and that part which is at the setting on of the Stern-Post, is called her *Rake aft-ward on*: When a Ship hath but a small *Rake forward on*, but is built with her Stern too fair up, she is called *Bluff-headed*.

The common Proportion for a Ship's *Rake forward on*, is more than a Third, but less than $\frac{1}{2}$ the length of her Keel: and the *Rake aft* is about a 4th or 5th of her *Rake before*. Tho' in this Proportion, there is no certainty, some Nations, and some Carpenters building with longer Rakes than others. A Long *Rake forward on*, if a Ship have also a good fat Bow, gives her a good Way, and helps her to keep a good Wind; but then this makes her apt to pitch under Water in a Head-Sea, and besides is a great Strife and Charge to a Ship, because she overhangs to a Head. Therefore the middle Proportion is best, considering all things.

RAKE of the Rudder. See *Rudder*.

RAKED Table, a Term in Architecture. See *Table*.

RAM Head, is the Name of a great Block (a-board a Ship) belonging to the Fore and Main-Halliards; it hath in it 3 Shivers, into which the Halliards are put, and at its Head the Tyes are reeved into an Hole made there for that Purpose.

RAMIFICATION, is a Collection of small Branches issuing out from one large one. Thus in Anatomy, the several Branches of the Aorta or Great Artery, by which the Arterial Blood is convey'd to all the extrem Parts of the Body, are called the *Ramifications* of the Artery: and when they are exceedingly small, they are called *Capillary Arteries*; which see.

RAMMER, is a Staff with a round piece of Wood at one end, in order to drive home the Powder to the Breech of the Great Gun, as also the Shot and the Wad, which keeps the Shot from rowling out. At the other end of these *Rammers*, are usually rolled in a certain Piece of Ships-skin fitted to the Bore of the Piece, in order to clear her after she has been discharged: And this is called Spunging the Piece.

RAMPANT: The Term in Heraldry for a Lion, or any Beast of Prey, in a Posture of Climbing, or Standing upright on his hinder Legs, and rearing up his Fore-feet. 'Tis different from *Salient*, which is a Posture not so erect. See *Salient*.

RAMPART, in Fortification, is the Mass of Earth which is raised about the Body of any Place, to covert it from Great Shot, and consists of several *Bastions* and *Curtains*; having its *Parapet*, *Platform*, *interior* and *exterior Talus*, and *Berme*, as also sometimes a Stone Wall, and then they say it is Lined. The Soldiers continually keep Guard here, and Pieces of Artillery are Planted for the Defence of the Place.

The Height of the *Rampart* must not exceed three Fathom, as being sufficient to cover the Houses from the Batteries of the Cannon: Neither ought its Thickness to be above ten or twelve, unless more Earth be taken out of the Ditch, than can be otherways bestowed.

The *Ramparts* of Half-Moons are the better for being low, that the small Fire of the Defendants may the better reach the Bottom of the Ditch; but yet

yet it must be so high, as not to be commanded by the Covert-way.

RAMUS Anterior, *Sc. Vena Subcutanea*, is a Branch of the *Subcutaneous Vein*, (which takes its Name from its shallow running just under the Skin) and is itself a Branch of the *Basilica*; it goes under the Muscles of the *Ulna* to the little Finger, where it joins a Branch of the *Cephalica*.

RAMUS Posterior, another Branch of the *Subcutaneous Vein* of the Arm, running near the Elbow; it sends out a Branch which goes to the Wrist, then it unites with the *Cephalica Interior*, and forms the *Mediana*.

RANDOM-Shot, is a Shot made when the Muzzle of a Gun is raised above the Horizontal Line, and is not designed to shoot directly or Point-blank. The utmost *Random* of any Piece, is about ten times as far as the Bullet will go Point-blank; and the Bullet will go farthest when the Piece is mounted to about 45 Degrees above the Level-Range. The Distance of the *Random* is reckoned from the Platform to the Place where the Ball first Grazes.

RANGE, a Term in Gunnery, signifying the Line a Shot goes in from the Mouth of the Piece. If the Bullet go in a Line parallel to the Horizon, that is called the *Right or Level-Range*; if the Gun be mounted to 45 Degr. then will the Ball have the highest or utmost Range, and so proportionably all others between 00 Degr. and 45°, are called the *Intermediate Ranges*.

RANGES, in a Ship, are two Pieces of Timber going a-crofs from Side to Side; one aloft on the *Fore-Castle* a little abaft the *Foremast*; and the other in the *Beak-Head* before the *Woudings* of the *Bow-Sprit*.

That in the *Fore-Castle*, is fastened into the Timbers of the Ship's-Sides, and hath two Knees about the Middle, on either Side the *Fore-Mast*, fastened to the Deck and the Timber, in which the *Top-Sail-Sheets* run in a Shiver: In it also are several *Wooden Pins* to belay the *Fore-bowling*, the *Fore-Tack*, and the *Fore-loof Hook*.

That in the *Beak-Head* lies in the Form of the other, and hath the *Sprit-Sail*, and *Sprit-Sail-Top-Sail-Sheets* and Ropes belayed about its Pins.

RANGER, is a Sworn Officer of the Forest, whereof there are Twelve: His Business chiefly consists in three Points; To walk daily through his Charge, to see, hear, and enquire, as well of Trespasses, as Trespassers in his Bailiwick; To drive the Beasts of the Forests, both of Venerly and Chase, out of the Disforested into the *Fore-Red Lands*; And, To prevent all Trespasses of the Forest. This *Ranger* is made by the King's Letters-Patent, and hath yearly Pension out of the *Exchequer*.

RANULA. See *Hypoglossum*.

RANULARES, are those Branches of the external Jugular Veins which run to the Tongue, and are very apparent under it.

RAPHE. See *Satura*.

RAPINE, in Law; to take a Thing in private against the Owner's Will, is properly Theft; but to take itroperly, or by Violence, is *Rapine*.

RAPSODY, originally signifies a Connection together, or a Repetition of a vast Number of Heroick Verses, such as those of *Homer*, &c. But now we usually understand by it, a long, tedious, impertinent spinning out of a Discourse to little or no Purpose, or Benefit to the Reader.

RAPTU Hæredis; is a Writ lying for the taking

away of an Heir holding in Socage; of which there are two Sorts; one when the Heir is Married, the other when he is not. Of both these, see the *Reg. Orig. Fol. 163*.

RARE Bodies, are such as have more Space, or take up more Room in Proportion to their Matter, than other Bodies do.

RAREFACIENTIA, rarifying Remedies; are such as by dissipating a little the Vapours and Humours, make the Pores of Bodies larger. *Blanchard*.

RAREFACTION, of any natural Body, is when it takes up more Dimensions, or a larger Space than it had before.

There are three Ways of Explicating of Rarefaction.

1. That of the *Aristotelians*, which is called the Rigorous Way, who suppose the same Body doth not only obtain a greater Space in Rarefaction, but also adequately fill it; and acquires larger Dimensions, without either having any Pores or Vacuities between its Corpuscles, or admitting any other Body or subtle Matter to be joined with them.

2. That of the *Cartesians*, which was also the Opinion of many of the Old Philosophers, who assert, That in Rarefaction the Pores of the rarefied Body are dilated, and replenished with some fine subtle and ethereal Substance, which insinuates it self freely into the Interstices between its disjointed Particles.

3. That of the *Atomists or Vacuists*, who suppose the Parts of the rarefied Body to be disjointed and removed farther from each other, and yet no other Body (necessarily) comes in between them. See this explained under *Air*.

RASANT Line of Defence, in Fortification, is a Line drawn from the Point of the Bastion along the Face, and prolonged till it come to the Curtain, and therefore shews how much of the Curtain will clear or scour the Face: This is called also the Second Flank, the Hanking, or Stringent Line.

RASETA, the same with *Carpus*.

RASH. See *Ratch*.

RASPATORIUM, or *Scalprum Rasorium*, is a Chirurgion's Instrument to scrape or shave filthy or scabby bones with.

RATCH, is a sort of a Wheel of 12 large Fangs, that runneth Concentrically to the Dial Wheel, and serveth to lift up the *Dentes* every Hour, and make the Clock strike: and are by some called *Rab*.

RATCHET, in a Watch, are the small Teeth at the Bottom of the Fusey or Barrel, that stop it in winding up.

RATE-Tythe, is when Sheep or other Cattle are kept in a Parish for a less Time than a Year, the Owner must pay *Tyths* for them *pro rata*, according to the Custom of the Place.

RATIFICATION, a Law-Term, used for the Confirmation of a Clerk in a Prebend, &c. formerly given him by the Bishop, &c. where the Right of Patronage is doubted to be in the King.

RATIO. When two Quantities are compared one with another in respect of their Greatness or Smallness. That Comparison is called *Ratio*, and signifies the *Rate*, *Reason* or *Proportion* in Quantity, that one hath to the other. Though some, indeed, confine *Ratio* or *Reason* only to two Numbers, and call it *Proportion*, when it is between 3, 4, or more Numbers or Quantities. But the Word *Proportion* is often used instead of *Ratio* or *Reason*, to express the Comparison of one single Quantity to another, by very good Authors.

RATIOCINATION, a Rational way of Arguing.

RATIONABILI parte bonorum, is a Writ that lies for the Wife against the Executors of her Husband, denying her the third Part of her Husband's Goods.

RATIONABILIBUS divisis, is a Writ that lies where two Lords, in divers Towns, have Seignories joining together, for him that findeth his Waste by little and little to have been encroached upon, against the other that hath Encroached, thereby to rectify their Bounds. And this is a King of *Justices*, and may be removed by a *Pone*, out of the County to the Common Bench. By the *Civilians* it is called *Judicium finium Regundorum*.

RATIONAL Horizon. See *Horizon*.

RATIONAL Quantities. Any Quantity being proposed, (for which we may always put 1.) and which *Euclid* (Book 10.) calls *Rational*, there may be infinite others which are Commensurable, or Incommensurable to it; and that either Simple, or in Power. Now, all such as are Commensurable any how to the given Quantity, he calls Rational Quantities, and all the others Irrational.

RATLINES, (or as the Seamen call them, *Ratlings*) are those Lines which make the Ladder Steps, to get up the Shrouds and Puttocks; therefore they are called the Ratlings of the Shrouds.

RAVELIN, in Fortification, is a small Triangular Work composed only of two Faces, which make a Salient Angle, without any Flanks. It is generally raised before the Curtains or Counterfarp, and commonly called a Half-Moon by the Soldiers.

A *Ravelin* is like the Point of a Bastion with Flanks cut off. The reason of its being placed before a Curtain, is to cover the opposite Flanks of the two next Bastions. 'Tis used also to cover a Bridge or a Gate; and 'tis always placed without the Moat.

What the Engineers call a Ravelin, the Soldiers generally call a Half-Moon, which see.

RAY Common, is a right Line drawn from the Point of the Concourse of the two Optical Axes, through the Middle of the right Line which passeth by the Centre of the Pupil of the Eye.

RAY Direct, is that which is carried from a Point of the visible Object directly to the Eye, through one and the same Medium.

RAY of Incidence, or Incident Ray, in Catoptricks, is a right Line which falls from some Point of an Object upon the Surface of the Looking-Glass or polished Metal.

RAY of Incidence, or Incident Ray, in Dioptricks, is the Ray of Light which goes in a right Line from a certain Point of the visible Objects in one Medium, until it meet with a Second Medium.

RAY in Opticks, is a Line imagined to pass from the Eye toward the Object, or from the Object toward the Eye, and is called a Visual Ray. But there is also a Pyramid of Rays, which strike the *Tunica Retina* of the Eye, and are broken or refracted in the Crystalline.

RAY Principal, in Perspective, is the perpendicular Distance between the Eye and the Vertical Plane, or Table, as the *French* call it.

RAY of Reflection is the right Line whereby the Reflection is made.

RAY of Refraction, or broken Ray, is a right Line whereby the Ray of Incidence changeth its re-

gitude, or is broken in traversing the Second Medium, whether it be thicker or thinner.

RAYS, or Beams of the Sun, or Rays of Light, are either according to the Atomical Hypothesis, those very minute Particles or Corpuscles of Matter, which continually issuing out of the Sun, do thrust on one another all around in Physically short Lines; (and that this is the right Opinion, many Experiments do evince, particularly the Incomparable *Sir Is. Newton* about Light and Colours) or else as the *Cartesians* assert, they are made by the Action of the Luminary on the Contiguous Ether and Air, and so are propagated every way in strait Lines, through the Pores of the Medium.

RAYS Convergent, are those which going from divers Points of the Object, incline towards one and the same Point tending to the Eye.

RAYS Divergent, are those which going from a Point of the visible Object, are dispersed, and continually depart one from another, according as they are removed from the Object.

RAYS Parallel, are those that keep an equal Distance from the visible Object to the Eye, which is supposed to be infinitely remote from the Object.

RAZANT Line of Defence. See *Rasant Line of Defence*.

REACH, is the Distance between any two Points of Land, that lie in a right Line one from another.

REALGAL, or *Sandaracha*, is red Arsenick.

REAL Horizon. See *Horizon*.

REAR-Guard, is that Part of an Army which follows the main Body, to hinder and stop Defectors.

REASON, in Mathematicks, the same with Proportion; 'tis better called by the *Latin* Name *Ratio* (which see) to avoid confounding it with the common Signification of the word *Reason*.

REATTACHMENT, is a Second *Attachment* of him that was formerly attached and dismissed the Court without Day, as by the not coming of the Justices, or some such Casualty. And is said to be either General or Special. General-Reattachment, is where a Man is reattached for his Appearance upon all Writs of Assize lying against him: Special-Reattachment, must be for one or more certain.

REBUSSES, are in Heraldry such Coats of Arms as bear an Allusion to the Surname of the Person, as 3 Conies for *Comisby*, 3 Cups for *Butler*, 3 Castles for *Castleton*: And such Bearings are very ancient.

REBUTTER, in Common-Law, when a Man grants Land to the use of himself, and the Issue of his Body, to another in Fee with Warranty: And the Donee leaseeth out his Lands to a Third for Years; the Heir of the Donor impleadeth, the Tenant alledging, That the Land was in Tail to him: The Donee comes in, and by virtue of the Warranty, made by the Donor, repelleth the Heir, because tho' the Land was Entailed to him, yet he is Heir to the Warrantor likewise; and this is called a *Rebutter*. And if I grant to my Tenant, to hold *Sine impetitione vassii*, and afterwards implead him for Waste made; he may debar me of this Action, by shewing my Grant; and this is also a *Rebutter*.

RECAPTION, is a Second Distress of one formerly distrained for the same Cause, and also during the Plea-grounded on the former Distress: It likewise

likewise signifies a Writ lying for the Party thus Disfrained.

RECEIVER. See *Recipient*.

RECEPTACULUM *Chyli*, was first found out by *Pocquet*, A. D. 1651, 'tis a Cavity into which all the Lacteal Veins empty themselves: it is of a Vesicular Substance, which is thicker in Men than in Beasts, but the Cavity is larger in Beasts than Men: Out of it goes the *Ductus Thoracicus*; which see.

RECESSION of the *Equinoxes*, is the going back of the Equinoctial Points every Year about 50 Seconds. The Reason of which is, That the Axis of the Earth, after many Annular Revolutions round the Sun, really deviates from that Parallelism, which it seems to keep with it self all the time of one Annular Revolution: By this Aberration it describes a Conical Superficies; and the Earth's Equator moving round the Sun; together with the Earth's Axis, the Intersections of the Celestial Equator with the Ecliptick, will run back, or move in *Antecedentia*, as will all other Points of the Ecliptick, (as well as those Equinoctial ones.) And therefore the Signs or Fix'd Stars that make the 12 Zodiacal Constellations, will appear to move forward, or in *Consequentia*; as they now seem to have done by the Quantity of a whole Sign; for which Reason, you find the Picture of the *Ram* painted on our Globes at the beginning of the Sign *Taurus*, &c.

Dr. *Gregory* in his Excellent *Astronomia Physica & Geometrica*, Prop. LXIV. Lib. 1. makes the Prolate Spheroidal Figure of the Earth, to be the Primary Occasion of this Recession of the Equinoctial Points; and withal shews that the Earth's Axis in every Annual Revolution round the Sun, twice changes its Inclination to the Ecliptick, and as often returns again to its former Position.

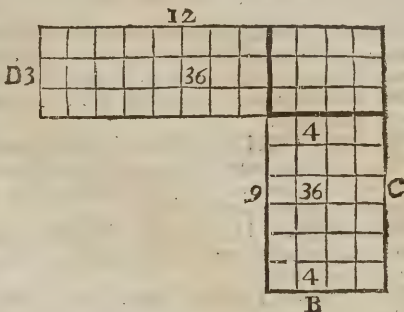
RECIDIVUS *Morbus*, a Relapse, is when the Morbifick Matter, that was left in the first Distemper, begins to work and ferment again.

RECIPIENTS, or *Receivers*, are those Vessels, which in Distillation, are Luted to the Beak, or Nose of Alembick, Retort, &c. to receive the Matter which is raised or forced over the Helm, by the Fire. That Glass also which is exhausted of Air by Mr. *Boyle's* Air-Pum, and within which any Animal or other Bodies, are included to make Experiments upon, is by him usually called the *Receiver*.

RECIPROCAL Figures in Geometry, are such as have the Antecedents and Consequents of the Ratio in both Figures.

Here A : B :: C : D;
z. e. 12 : 4 :: 9 : 3.

A



B

That is, as much longer as the Side A in the first Rectangle is than B : so much deeper is the Side C in the second Rectangle, than the Side D in the first; and consequently the Length of one is compensated by the Depth of the other; and also as the Side A is $\frac{1}{3}$ longer than the Side C, so the Side B is one 4th longer than D. Wherefore the Rectangles must needs be equal.

And this is the Foundation of the *Catholick Theorem*; That the Rectangle of the Extreams must always be equal to that of the Means: And consequently the Reason of the Rule of Three, or Golden Rule; for suppose there was given any three Numbers, or Quantities Geometrically proportional, as A, B, and C, and that it were required to find a fourth D proportional to them.

Since it is that A : B :: C : D therefore $A \cdot D = B \cdot C$, and consequently $D = \frac{B \cdot C}{A}$; that is, the Fourth Term is equal to the Quotient of the Second, multiplied by the Third Term, divided by the First:

Or thus in Numbers.

Suppose given 12, 4, and 9; required a fourth Proportional.

Now as 12 : 4 :: 9 : Q

But $12 \cdot Q = 4 \cdot 9 = 36$.

Therefore $Q = \frac{4 \cdot 9}{12} = 3$, by dividing both Sides by 12.

COROLLARY.

And from hence 'tis plain, That if any two Triangles, Parallelograms, Prisms, Parallelopipeds, Pyramids, Cones, or Cylinders, have their Bases and Altitudes Reciprocally proportional, those two Figures or Solids are equal to one another; and vice versa, if they are equal, their Bases and Altitudes are Reciprocally proportionable.

RECIPROCAL Proportion, is when in four Numbers, the Fourth is lesser than the Second, by so much as the Third is greater than the First, and vice

vice versa; on which is founded the Inverse or Indirect Rule of *Trees*, thus:

4 : 10 :: 8 : 5.

See the *Corollary* after Reciprocal Figures.

There is great use made of this *Reciprocal Proportion*, by Sir *Isaac Newton*, and others, in their Demonstrations of the *Laws of Motion*, &c. and indeed without a clear knowledge of it, they cannot be understood.

RECLINATION of a Plain, is the Quantity of Degrees which any Plain, on which a Dial is supposed to be drawn, lies or falls backwards from the truly upright or vertical Plain.

RECLINING, in Dyalling, the Plane that leans from you when you stand before it, is said to be a *Reclining Plane*.

RECLINING Declining Dyals. See *Declining Reclining Dyals*.

RECOGNIZANCE, in Law, is a Bond or Obligation of Record, testifying the *Recognisor* to owe to the *Recognisee* a certain Sum of Money, and is acknowledged in some Court of Record, or before some Judge, Master of the Chancery, or Justice of Peace; and those that be meer *Recognisances*, are not Sealed but Enrolled, and Execution by force thereof, is of all the *Recognisor's* Goods or Chattels, (except Draught Beasts and Implements of Husbandry) and the Moiety of his Lands.

RECOGNISEE, is he to whom one is bound in a *Recognisance*.

RECOGNITIONE adnullanda per vim & duritiam facta, is a Writ to the Justices of the Common Bench, for the sending of a Record touching a *Recognisance* which the *Recognisor* suggests to have been acknowledged by force and duress, that if it be so, it may be annulled.

RECOGNITORS, is a Word often used for the Jury Impannelled upon an Assize: The reason why they are so called, is, because they acknowledge a *Diffelsin* by their Verdict.

RECOLLECTION, is a Mode of Thinking, whereby those Ideas sought after by the Mind, are with Pain and endeavour found, and brought again to view.

RECORD, in Law, signifies an Authentick and Uncontroulable Testimony in Writing, contained in Rolls of Parchment, and preserved in Courts of Record; and they are said to be *vetustatis & veritatis vestigia*. An Act committed to Writing in any of the King's Courts, during the Term wherein it is Written, is alterable, being no Record; but that Term once ended, and the Act Enrolled, it is a *Record*, and of that Credit, that admits no alteration or proof to the contrary. Lawyers reckon three sorts of Records, viz. *Record Judicial*, as Attainder, &c. *Record Ministerial* upon Oath, as an Office or Inquisition found. And a *Record* made by Conveyance, and Consent, as a Fine or Deed Enrolled, or the like.

RECORDARE facias, or *Recordari facias*, is a Writ directed to the Sheriff, to remove a Cause depending in an Inferior Court, as Court of ancient Demesne, Hundred or County, to the King's Bench, or Common-Pleas; it seems to be called *Recordare*, because it commands the Sheriff to make a Record of the Proceedings by himself and others, and then to send up the Cause.

saiv

RECORDER, is he whom the Mayor, or other Magistrate of any City, or Town Corporate having Jurisdiction, or a Court of Record within their Precincts, by the King's Grants, doth associate unto him for his better Direction in Matters of Justice and Proceedings according to Law; and is therefore for the most part a Man versed and experienced in the Law.

RECORDO & processu Mittendis, is a Writ to call a Record together, with the whole Proceeding in the Cause, out of an Inferior Court into the King's-Bench Court.

RECORDO utlagare Mittendo, is a Judicial Writ; which see in *Reg. Judic. fol. 32.*

RECOVERY, in a Legal Sense, signifies an obtaining any thing by Judgment or Tryal at Law, as *Evictio* doth among the *Civilians*.

And there is a *True* and a *Feigned Recovery*: A *True Recovery* is an actual or real Recovery of any thing, or the Value thereof by Judgment; as if a Man sue for any Land, or other thing moveable or immoveable, and have a Verdict and Judgment for him.

A *Feigned Recovery*, is, (as the *Civilians* call it) *Quadam fictio juris*, a Certain Form or Course set down by Law, to be observed, for the better assuring of Lands and Tenements unto us; and the end and effect thereof is to discontinue and destroy Estates Tail, Remainders and Reversions, and to bar the Intails thereof.

And in this Formalty are required three Persons, viz. The *Demandant*, *Tenant*, and *Vouchee*.

The *Demandant*, is he that brings the Writ of Entry, and may be termed the *Recoverer*.

The *Tenant*, is he against whom the Writ is brought, and may be termed the *Recoveree*.

The *Vouchee*, is he whom the Tenant voucheth, and calls to Warranty for the Land in demand.

A *Recovery with double Voucher*, is, where the Tenant voucheth one, who voucheth another, or the common Vouchee.

And a *Recovery with treble Vouchers*, is where three are vouched: As when a Man that is desirous to cut off an Estate Tail in Lands or Tenements, to the end, to sell, give, or bequeath it, causes a *Feigned Writ* of Entry, *Sur disseisin en le poit*, to be brought for the Lands of which he intends to cut off the Entail, and in a *Feigned Count*, or Declaration thereupon made, pretends he was disseised by him, who by a *Feigned Fine* or Deed of Bargain and Sale, is named and supposed to be the Tenant of the Land. This *Feigned Tenant*, if it be a *Single Recovery*, is made to appear and Vouch the *Bag-bearer* of Writs for the *Custos brevium*, in the Common Pleas, (for there only can such Recoveries be suffered) who makes Default. Whereupon the Land is recovered by him that brought the Writ, and a Judgment is by such fiction of Law entred, that the Demandant shall recover the Value of the Lands against the Lands of the *Vouchee*.

Bag-bearer is a Poor Unlanded and Illiterate Person, which is feigned to be a Satisfaction to the Heir in Tail, tho' he is never to have or expect it.

This *Feigned Recovery*, is also called a *Common Recovery*, because it is a beaten and common Path to that end for which it is appointed, viz. to cut off the Estates above specified. But a *True Recovery* is as well of the Value as of the Thing: As if a Man buy Land of another with Warranty, which Land

a third

a third Person afterwards by Suit of Law recovereth against me, I have my Remedy against him that sold it me, to recover in Value; that is, to recover so much in Money, as the Land is Worth; or so much other Land by way of Exchange.

RECOUPE, in Law, is a quick and sharp Reply to a peremptory Demand, and used by Lawyers to defalk or discount; as if a Man hath Ten Pounds issuing out of certain Lands; and he disseises the Tenant of the Land in an Assise brought by the Disseisee, the Disseisor shall *Recoupe* the Rent in the Damages.

RECREMENT, any Superfluous Matter in the Blood or Body, or any of its Parts.

RECREMENTS, a Word used by the Physicians and Anatomists, for such Juices as are separated in the several Glands of the Body for proper and peculiar Uses; as the Spirits, the Lympha, the Gall, the Pancreatic Juice, the proper Ferments of the Stomach, Guts, &c. and these are distinguish'd from Excrements, which are expelled out of the Body, as being of no further Use to it.

RECTANGLE, in Arithmetick, is the same with Product; which see.

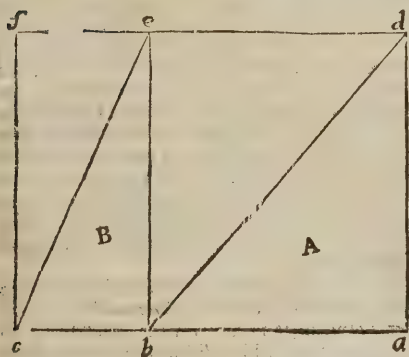
RECTANGLES in Geometry, are Parallelograms, whose Sides are unequal, but Angles right. Their Area is found by multiplying the two unequal Sides one into another, for then the Product is the Superficial Content or Area.

RECAINGLED Triangle, the same with Right-angled Triangle.

All Rectangles, (as A and B) which have the same Height, are to one another as their Bases.

That is,

$$\square A : \square B :: ab : bc.$$



For A is made by the Multiplication of ba its Base by the Line be ; and B is also made by multiplying cb its Base by the same Line be (or its equal cf).

But the Product of any two Numbers Multiplied by the same Third Number, are as those Numbers were to each other before Multiplication. Therefore,

$$A : B :: ab : bc. \quad Q. E. D.$$

Hence all Rectangles, or Parallelograms, between the same Parallel Lines, or which have the same Height, must be to one another as their Bases are.

For they are all equal to Rectangles, on the same or equal Bases with themselves, and consequently must have the same Proportion to each other, as such Rectangles; that is, be to each other as their Bases. *Q. E. D.*

And the same Thing must be true of all Triangles that are between the same Parallels, or which have the same Height, because they are the halves of those Parallelograms. See the Figure.

RECTANGULAR, or Right-angled, is spoken of a Plain Figure in Geometry, when one or more of its Angles are right: Of Solids, 'tis spoken in respect of their Situation: For if their Axes be perpendicular to the Plane of the Horizon, they are therefore Rectangular, or Right Cones, Cylinders, &c.

RECTANGULAR Section of a Cone; by this the Ancient Geometers always meant a *Parabola*, which Conick Section, before *Apollonius*, was only considered in a Cone, whose Section by the Axe would be a Triangle, Right-angled at the Vertex: And hence it was that *Archimedes* entituled his Book of the *Quadrature of the Parabola*, (as 'tis now called) by the Name of *Rectanguli Coni Sectio*.

RECTIFIE, or Rectification, in Chymistry, is the Distilling over again of any Spirit, in order to a more fine and pure State; and to separate from it any Heterogeneous Parts, that might rise with it before.

RECTIFIE, is a Word used in the Description and Use of Globe, or Sphere. For the first Thing to be done before any Problems can be wrought on the Globe, is to *Rectify it*. That is, to bring the Sun's Place in the Ecliptick on the Globe, to the graduated Side of the Bras Meridian, to elevate the Pole above the Horizon, as much as is the Latitude of the Place, and to fit the Hour Index exactly to Twelve at Noon, screwing also the Quadrant of Altitude, (if there be Occasion) to the Zenith. All this is comprehended under the Word *rectify the Globe*: And when this is done, the (Celestial) Globe represents the true Posture of the Heavens, for the Noon of that Day it is Rectified for.

RECTIFIER (in Navigation) is an Instrument consisting of two Parts, which are two Circles either laid one upon, or let into the other, and so fastened together in their Centers, that they represent two Compasses, one fixed, the other moveable; each of them divided into the 32 Points of the Compass, and 360 Degtees, and numbred both Ways, both from the North and the South, ending at the East and West, in 90 Degrees.

The Fixed Compass, represents the Horizon, in which the North, and all the other Points of the Compass are fixed and immoveable.

The Moveable Compass represents the Mariners Compass, in which the North, and all the other Points are liable to Variation.

In the Centre of the Moveable Compass is fastned a Silk Thread, long enough to reach the out-side of the Fixed Compass. But if the Instrument be made of Wood, there is an Index instead of the Thread.

Its Use is to find the Variation of the Compass, to rectify the Course at Sea; having the Amplitude or Azimuth given.

RECTIFYING of Curves, (in Mathematicks) is to find a Strait Line, equal to a Curved one; or a Plane equal to a curved Surface.

Of this Dr. Wallis gave the first Hint to the World, in his Arithmetick of Infinites, *Prop. 28. §3. Scholium.*

Soon after which, Mr. William Neil applied those Considerations to the *Semi-cubical Paraboloid*, where the Cubes of the Ordinates are as the Squares of the Diameters: And shewed that, there the small Segments of the Curve, cut by the Ordinates at equal Distances, are as the Ordinates in a Parabola, and therefore their Squares increased by Equals, in Arithmetical Progression: Wherefore that Curve must be to a Right Line :: as the Trunk of a Parabola, to the Parabola: Which, the Quadrature of the Parabola being known, is a known Proportion; and this was the first Attempt of this Nature. But it was afterwards soon demonstrated also by Sir Christopher Wren, my Lord Brouncker, and by Dr. Wallis. And the Year following, viz. 1658, Sir Christopher Wren shewed the Curve of the Cycloid, to be Quadruple of its Axis: Which was the second Demonstration of a Straight Line equal to a crooked one. Of which see Dr. Wallis's *English Algebra*, p. 292, &c. See more also in his Excellent Book of *Cycloide*.

RECTILINEAL, or Right-lined, in Geometry, is spoken of such Figures as have their Extremities all Right Lines.

RECTI Minores, are two small Muscles of the Head, appearing both in Sight at once: They arise fleshy from the Posterior Part of the first *Vertebra* of the Neck; and are so inserted to the middle Part of the *Os Occipitis* in two shallow Depressures of the said Bone: These from their Use, may be called *Rementes* or Noddors backward, and are Antagonists to those we call *Annuentes*.

RECTO, is a Writ of Right, and is of so high a Nature, that whereas other Writs in real Actions are only to recover the Possession of Lands or Tenements in Question, which have been lost by our Ancestors or our selves; this aimeth to recover both the Seisin, which some of our Ancestors or we had, and also the Property of the Thing whereof the Ancestor died not Seized, as of Fee, and whereby are Pleaded and Tried both their Rights together, viz. as well of Possession as Property: So that if a Man once lose his Cause upon this Writ, either by Judgment, Affize, or Battle, he is without all Remedy, and shall be excluded *per exceptionem rei Judicatae*.

It is divided into two Kinds, *Rectum Patens*, a Writ of right Patent; and *Rectum Clausum*, a Writ of right Close. This the *Civilians* call *Judicium Pettitorum*. The Writ of right Patent is so called, because it is sent upon, and is in Nature the highest Writ of all others, lying always for him that hath Fee-simple in the Lands or Tenements sued for, and not for any other. And when it lieth for him that Challengeth, Fee-simple, and in what Cases, see F. N. B. Fol. 1. 6. This Writ is also called, *Brevé magnum de recto*. A Writ of right Close, is a Writ directed to a Lord of *Ancient Demesne*, and lieth for those which hold their Lands and Tenements by Charter in Fee-simple, or in Fee-Tail, or for Term of Life, or in Dower, if they be ejected out of such Lands, &c. or disseised. In this Case, a Man or his Heirs may sue out this Writ of right Close, directed to the Lord of the *Ancient Demesne*, commanding him to do him right, &c. in his Court. And this is called, *Brevé parvum de recto*.

RECTO de Advocacione Ecclesie, is a Writ of Right lying where a Man hath right of Advowson,

and the Parson of the Church dying, a Stranger presents his Clerk to the Church, and he not having brought his Action of *Quare Impedit* nor *Darrein Presentment* within Six Months, but suffered the Stranger to Usurp upon him. And this Writ he only may have, that claimeth the *Advowson* to himself, and to his Heirs in Fee; and as it lies for the whole *Advowson*, so it lies also for the half, third or fourth Part.

RECTO de Custodia terra &c. hereditis, was a Writ that lay for him whose Tenant holding of him in Chivalry, died in Nonage, against a Stranger that entered upon the Land, and took the Body of the Heir; and is now become useless as to Lands holden in *Capite*, or by *Knights Service*, but not when there is Guardian in *Socage*, or appointed by the last Will and Testament of the Ancestor.

RECTO de Dote, is a Writ of Right of Dower, which lieth for a Woman that hath received Part of her Dower, and purposes to demand the Remainder in the same Town, against the Heir, or his Guardian, if he be a Ward.

RECTO de dote unde nihil habet, is a Writ of Right, which lies in case where the Husband having divers Lands or Tenements, hath assured no Dower to his Wife; and she thereby is driven to sue for her Thirds, against the Heir or his Guardian.

RECTO de rationabili parte, is a Writ that lies always between Privies of Blood; as Brothers in *Germskind*, or Sisters, or other Coparceners, as Nephews or Nieces, and for Land in Fee-simple; as if a Man lease his Land for Term of Life, and afterwards dies, leaves issue two Daughters, and after that the Tenant for Term of Life dieth also, the one Sister entrench upon all the Land, and so deforming the other, the Sister so deformed shall have this Writ to recover part.

RECTO quando Dominus remisit, is a Writ of Right, which lies in case where Lands or Tenements being in the Seigniorship of any Lord, are in Demand by a Writ of Right; for if the Lord hold no Court, or otherwise, at the Prayer of the Demandant, or Tenant, shall send to the Court of the King his Writ, to put the Cause thither for that Time, (saving to him at other Times the Right of his Seigniorship) then the Writ issues out for the other Party, and hath the Name from the Words contained, being the true Occasion thereof. This Writ is *Close*, and must be returned before the Justices of the *Common-Bench*.

RECTO sur Disclaimere, is a Writ that lies when a Lord in the King's Court of *Common-Pleas* avows upon his Tenant, and the Tenant disclaimeth to hold of him; upon which disclaimer he shall have this Writ; and if the Lord aver and prove, That the Land is held of him, he shall recover the Land for ever.

RECTUM Intestinum, is the strait Gut which begins at the first *Vertebra* of the *Os Sacrum*, and passeth strait downward to the Extremity of the *Rump*, or utmost End of the Back-bone. It is about a Foot in length, and not so wide as the *Colon*; but its Membranes are thicker.

RECTUS Femoris, is a Muscle of the Leg, so named from its streight Progress and Situation; it riseth fleshy from the Tubercle of the *Os Ilium*, that is in the Mid-way between the fore-part of its Spine and the *Acetabulum*, from thence descending directly between the *Vastus Externus* and *Internus*, and over the *Crureus*. Its Fibres externally descend from a middle Line obliquely Laterally: Internally

nally they run according to the Length, and become entirely Tendinous four Fingers breadth above the *Patella*, where it is united with the Tendons of the *Vastus Externus* and *Internus*, and *Cru-reus*, and inserted together with 'em at the Upper part of the *Tibia*. It serves to help to extend the *Tibia*.

RECTUS in Curia, signifies one that stands at the Bar, and no Man objects any thing against him. Also, when a Man hath reversed the Outlawry, and can participate of the benefit of the Law, he is *Rectus in Curia*.

RECTUS Internus Major, is a Muscle of the Head which arises Tendinous, but chiefly Fleshy, from the fore-part of all the Transverse Processes of the *Vertebrae* of the Neck, except the first and second, and in its Ascent becoming Fleshy, passes over those two superior *Vertebrae*, and is inserted to the Anterior Appendix of the *Os Occipitis*, near the great *Foramen*, that transmits the *Medulla Oblongata*. This manifestly bends the Head forwards, and therefore may be called *Flexor Capitis*, from its Use.

RECTUS Internus Minor, is a Muscle of the Head, which with its Partner appears on the Fore-part of the 1st *Vertebra*, like the *Recti Minores* on the Back-part, and arise near its Transverse Processes, and ascending directly, are inserted to the Anterior Appendix of the *Os Occipitis* immediately under the former. These nod the Head forward, and are Antagonists to the *Recti Minores*. Wherefore they may be called *Annenies*.

RECTUS Lateralis, is a short, thick, fleshy, Muscle of the Head, arising from the superior part of the Extremity of the Transverse Process of the first *Vertebra* of the Neck, between the former and *obliquus Superior*, thence ascends directly to its Insertion to the *Os Occipitis* in the Interspace made by the *Processus Mammillaris* and *Styloides*. This nods the Head to one side.

RECTUS Major, is a Muscle of the Head, which ariseth partly Tendinous, but chiefly Fleshy, from the superior Part of the double Spines of the second *Vertebra* of the Neck, and in its ascent becomes broader and Fleshy, and is so inserted to the posterior Part of the *Os Occipitis*: This Muscle with its Partner acting, pulls the Head directly back on the first *Vertebra*.

RECTUS Musculus, one of the Muscles of the *Abdomen*, so called from the Uprightness of its position. Its Use in common with the other Muscles of this Part, is to help to exclude the *Feces* and *Urine*, by the compression of the *Abdomen*.

RECTUS Palpebrae Superioris, is a Muscle which lifts up the upper Eye-lid.

RECURRENT Nerves, by some called *Vocal*, because they are spent upon the Instruments of Speech, and which *Galen* saith he tried to cut, and by that means rendred the Animal Mute. This *Dr. Willis* takes to be a distinct Pair by it self, but 'tis usually reckoned a Branch of the *Par-vagum* or 8th Pair, springing out of their Trunks, and so called, because first they descend, and then ascend again to supply the Muscles of the *Larynx*.

REDDENDUM, a Word used substantively for the Clause in a Lease, &c. whereby the Rent is reserved to the Lessor.

REDDITION, is a Judicial Confession and Acknowledgment, that the Land or thing in Demand, belongs to the Demandant, or at least not to the Person so surrendering.

REDENT, in Fortification, is a Work made in Form of the Teeth of a Saw, with *Sahani* and *Reentring-Angles*, to the end that one part may defend another. These sort of Works are usually erected on that side of a Place which looks towards a Marsh or River.

REDINTEGRATION, a restoring any Mixt Body or Matter whose Form is destroyed, to the same Nature and Constitution, and that it shall have the same Properties it had before.

The Honourable Mr. Boyle, hath a particular Treatise about the *Redintegration* of Salt-petre; in which he proves, that after Nitre had been fluxed in a Crucible over a strong Heat, and after all its volatile Parts had been forced away by the injection of lighted Coals so often into the Crucible, that no farther Detonation would happen; by which means the Salt-petre was turned into that Body which is called *Fixt Nitre*, and which is very nearly akin, in all its Properties, to fixt Salt of Tartar; yet he could very speedily, by pouring in this fixt Salt-petre, either diluted with a due proportion of Water, or let run *per se* into a Deliquium, a sufficient quantity of Spirit of Nitre, (which by the by amounted nearly to the quantity of that volatile Part which was burnt off) he could, I say, suddenly reproduce true Crystals of Salt-petre of the common Form and Virtue.

REDISSEISIN, is a *Disseisin* made by him that once before was made and adjudged to have *Disseised* the same Man of his Lands or Tenements; for which there lies a special Writ, called a Writ of *Redisseisin*.

RED-Lead, how made. See *Minium*.

REDOUBT, in Fortification, is a small Fort of a square Figure, having no Defence but in the Front, its use being to maintain the *Lines of Circumvallation*, *Contravallation*, and *Approach*. In Marly Grounds, these *Redoubts* are often made of Mason's Work for the Security of the Neighbourhood. Their *Face* consists of from ten to fifteen Fathom; the Ditch round about being from eight to nine Foot broad and deep, and their *Parapets* having the same thickness.

REDUBBORS, are those which buy stolen Cloth, knowing it such, and change it into some other Form or Colour that it may not be known.

REDUCING Scale, is a thin broad piece of Box with several different *Scales* of equal Parts, and Lines to turn Chains and Links into Acres and Rods, by Inspection; and is used by Surveyors to reduce any Map or Draught. It is sometimes called, the *Surveying-Scale*.

REDUCT, a Military term, signifying an advantageous piece of Ground, entrenched and separated from the rest of the Place, to retire to in case of surprize.

REDUCTION, in Astronomy, is the difference between the Argument of Inclination and the Eccentricity Longitude; that is to say, the Difference of the two Arches of the Orbit, and the Ecliptick, intercepted between the Node and the Circle of Inclination.

REDUCTION of Decimals. See *Decimals*.

REDUCTION of Equations, in Algebra, is the clearing of them from all superfluous Quantities, and the separating of the known Quantities from the unknown, to the end that at length every respective Equation may remain in the fewest and simplest Terms, and so disposed, that the known Quantity or Quantities may possess one

part thereof, and the unknown the other. See *Equation*.

REDUCTION of Fractions. See *Fractions*.

REDUCTION of Money, Weights, Measure, &c. is of two kinds. 1. When a Quantity is to be brought from any higher Denomination into a lower, and this is done, by considering how many of the next lesser Denomination are contained in the next greater before, and by that number multiplying the greater; as *Pounds* are brought into *Shillings* by Multiplying by 20, *Shillings* into *Pence* by 12, and *Pence* into *Farthings* by 4. Also, *Troy Weight* may be reduced into Grains, by Multiplying by 12, 20, and 24. And *Averdupois Great Weight* into Ounces, by 4, 28, and 16.

2. If it be to bring the lower to a higher, then divide the least by so many of its Denominations as are contained in the next greater. Thus 24720 Pence is 103 Pounds: But if there remains any thing after Division, they are the odd Pence and Shillings; as 6713 Pence Reduced, gives 27 l. 19 s. 5 d.

Note, That the way to reduce Shillings into Pounds, is to cut off the last Figure, and take half of the rest, as in the last Instance.

13) 6713 (551 | 9 (27 l. 19 s. 5 d.

71

113

5 d.

After the same manner may *Troy Weight*, *Averdupois Weight*, or any other Weight or Measure be reduced.

Likewise *Foreign Coin* may be reduced into *English*, by turning the Value into *English Coin* of any Part: As, what is the value of 223 *Scotch Marks*, each equal to 13 d. $\frac{1}{2}$ *English*? which is 54 Farthings, and 223 by 54 = 12042 Farthings, which reduced backwards to Pounds, Shillings, and Pence, makes 12 l. 18 s. 10 $\frac{1}{2}$ d.

REDUPPLICATIVE Propositions, are such wherein the *Subject* is repeated: Thus, Men, as Men, are Rational; Kings, as Kings, are subject to none but God.

RE-ENTRING Angle, a Term in Fortification. See *Angle*.

RE-ENTRY, in Law, signifies the resuming and retaking that Possession which we had lately forgoe: As if I make a Lease of Land or Tenement, I do therefore forego the Possession; and if I do condition with the Lessee, That for Non-payment of the Rent at the Day, it shall be lawful for me to *Re-enter*; this is as much as if I condition'd to take again the Lands, &c. into my own Hands, and to recover the Possession by my own Fact, without the assistance of Judge, or other Process.

REEF, a Term in Navigation: When there is a great Gale of Wind, they commonly roll up part of the Sail below, that by that means it may become the narrower, and so not draw so much Wind. And this contracting or taking up the Sail, they call a *Reef* or *Reefing* the Sail; and when it is done, they say the Sail is *Reefed*.

Also, when a Top-Mast is *Sprung*, as they call it, i. e. crackt or almost broken in the Cap, they

cut off the lower piece that was near broken off, and setting the other part, now much shorter, in the Step again, they call it a *Reeft* Top-Mast.

REEVE, is to put a Rope through a Block; and to pull a Rope out of a Block is called *Unreeving*.

REFLECTION, in general, is the regress or return that happens to a moving Body, because of the meeting of another Body, which it cannot penetrate. Thus the material Rays of Light are reflected variously from such Bodies as they cannot pass through.

REFLECTION, in *Metaphysics*, Mr. Lock defines to be, That Notice which the Mind takes of its own Operations, and the Manner of them; by reason whereof there come to be Ideas of those Operations in the Understanding.

REFLECTION of the Rays of Light. Sir Isaac Newton, finding by Experiment that Light was an Heterogeneous Body, consisting of a Mixture of differently refrangible Rays; and consequently concluding no further Improvement could well be made in Optical Instruments in the Dioptrick way, he took *Reflections* into Consideration, and tells us, that by their help, Optick Instruments might be brought to any degree of Perfection, if we could but find a reflecting Substance which would Polish as finely as Glass, reflect as much Light as Glass transmits, and be formed into a Parabolical Figure.

An Experiment of which he made in the kind of a Catoptrick Telescope, (which I have seen at Gresham College) and by which, tho' not above two Foot long, he could (he saith) discern the jovial Satellites, and the Phases of Venus. *Phil. Transf.* N. 18. See Vol. 2.

REFLECTED Ray, or *Ray of Reflection*, is that whereby the *Reflection* is made upon the Surface of a reflecting Body.

REFLECTING, or *Reflexive Dyals*, are made by a little piece of Looking-Glass-Plate, duly placed, which reflects the Sun's Rays to the top of a Ceiling, &c. where the Dial is drawn. This Glass should be as thin as can well be ground. For the making of these Dyals, there are many Methods: Of the two following, the 1st is Mr. Collins's, the 2d Dr. Clark's.

First, Determine the most convenient Point in the Window, where to place the *Reflecting Glass*, as near the Ceiling as you can conveniently, provided it be not so near as that the Cornish of the Window will shade the Glass when the Sun is high in Summer; suppose within about 10 or 11 Inches of the Ceiling, at least of that Ceiling which belongs to the Window it self; then from that Point draw a true Meridian upon a plane Horizontally placed against the determined Point in the Window, and to that Meridian fit an Horizontal Dial; but invert it so, that the Axis or Stile may point downward, and be under the Horizontal Plane, according to the Elevation of the Pole, which Stile must be placed truly also in the Plane of the Meridian; then by the help of a Thread running from the Centre along the Stile, find where that Stile would cut the Floor, or any other Place, if it were produced, and drive a Nail into that Point, and fasten also a Thread there long enough to be extended to any part of the Ceiling,

Fasten

Fasten also another long Thread to the Centre of the Horizontal Dial, which let it be extended Horizontally, as the Plane will direct, and exactly over every Hour-Line in order, whilst in the mean time you extend the Thread which was fastened to the Nail in the Stile, to the Ceiling, but so as it may touch the other Horizontal Thread: Then mark that Point in the Ceiling which the extended Thread toucheth, and make more such Marks, whereby to draw the Hour-Lines upon the Ceiling; and do this in like manner for the rest of the Hours, Half-Hours, and Quarters.

Then take all away, and place your Glass Horizontally; and because your Glass hath some Thickness, place it a little under the determined Point, that the Centre of the Glass may be just in the imaginary Axis, which goes to the Nail; for wheresoever you place it, in that it will go true.

But because it may be troublesome to place an Horizontal Dial fast enough and exactly, as also to find the Point where the Nail is to be driven, I will shew you another Method, which may be more easily practised.

First, Draw an Horizontal Dial upon the back of some Table or Floor, and draw a Meridian upon the Bay-board of the Window, by a Thread or perpendicular black Line, passing through the Point where you intend your Reflecting Glass shall be, and by a Plumb-Line translate it from the Bay-board to the Ceiling. Take the nearest Distance between the Glass and the Ceiling; with this Distance come to the Horizontal Dial, and set one end of it on that Part of the Axis where the other will just touch the Meridian; that Point in the Axis may be called the Glass Point; from which erect a Perpendicular; and where it cuts the Meridian, make a Point, which will be the Equinoctial Point, from which also erect a Perpendicular, which will be a Tangent; then at some Distance on which Side of the Equinoctial Point you find most convenient, erect another Tangent there, two Tangents will cut the Hour-Lines in Points, which may be called the Hour-Points.

Then take the Distance betwixt the Glass-Points, and the Equinoctial-Point, and extend it from the Glass toward the Meridian, and where it toucheth, that is the Equinoctial-Point upon the Ceiling.

Lastly, Set off correspondent Tangent-Lines upon the Ceiling, and make like Hour-Points, draw the Hour-Lines, you need not blot out the Equinoctial Tangent, it being pleasant to see how the Sun will go in that Line all Day, when it is in the Equinoctial. Besides, the Equinoctial-Point will tell you on that Day whether your Glass lie Horizontally, which is somewhat difficult otherwise to determine. Or upon any Day you may Calculate the Sun's Meridian Altitude, and see whether it falls just upon that Point in the Meridian at 12 a Clock.

This Dial is nothing but an Horizontal Inverted, the Center whereof is in the Air without, except you make a North Dial, and then it will be upon the Ceiling, which you must find by its Distance from the Equinoctial-Point, and let that Centre govern your Tangents. The Ground of this Dial is, that the Angles of Reflection are equal to the Angles of Incidence.

Sometimes, instead of two Tangents, you may use two Circles, especially when the Centre of the Dial is upon the Ceiling, or when your Glass is

near the Window-Ceiling, then the Equinoctial Point will be upon that Ceiling, and you may project the Hour-Lines upon the Chamber Ceiling, or the Walls, by one Thread extended over the Hour-Lines, and another Thread touching that, and extended from the Equinoctial-Point, or any Point in the imaginary Axis to the Ceiling or Wall.

REFLECTING Telescope. See *Telescope*.

REFLEXION of the Moon, is (according to *Bullialdus*) her 3d Inequality of Motion: This *Tycho* calls by the Name of her *Variation*, which see.

REFLUX of the Sea, is the *Ebbing* of the Water off from the Shore; as its coming on upon it, or Tide of Flood, is called the Flux of the Sea. See *Tide*.

REFRACTED Angle, in Opticks, is the Angle contained between the refracted Ray and the Perpendicular.

REFRACTED Dials, may be made thus: Stick up a Pin, or assign any Point in any Concave Bowl, and make that the Center of the Horizontal Dial, assigning the Meridian-Line on the Edges of the Bowl, and taking away the Horizontal Dial, elevate a String or Thread from the end of the said Pin fastened thereto, over the Meridian-Line, equal to the Elevation of the Pole or Latitude of the Place; then with a Candle, or if you bring the Thread to the Shade upon any Hour-Point formerly marked out on the Edges of the Bowl, at the same time the Shade in the Bowl is the Hour-Line.

And if the Bowl be full of Water, or any other Liquor, you may draw the Hour-Lines, which will never shew the true Hour, unless filled with the said Liquor again.

REFRACTION, in general, is the Incurvation or change of Determination in the Body moved, which happens to it, whilst it enters or penetrates any Medium.

In Dioptricks, it is the Variation of a Ray of Light, from that right Line which it would have passed on in, had not the Density of the Medium turned it aside.

Dr. *Hook* discovered by Experiment, That the *Sines* of the Angles of Incidence of the Rays of Light, are proportionable to the *Sines* of Refraction. See the Preface to *Micrographia*, where his Instrument is described, by which he made the Discovery.

Sir *Isaac Newton* found that the Rays of Light are Incurvated or Refracted in their Motion, whenever they come near the Edges of any Body, tho' it be not Diaphanous. See *Light*.

And he thinks that the Errors of Refraction in Optick Glasses might be corrected, if two Spherical Glasses were combined together with Water included between them. And such Glasses he judges preferable to Elliptical or Hyperbolical ones, because (besides that they can be more easily ground) they do more accurately refract the Pencils of Rays posited without the Axis of the Glass.

Dr. *Wallis* in *Philos. Trans.* N. 187, saith, That tho' Refraction by Vapours near the Horizon, may make a thing appear higher; yet it cannot make it appear broader; whereas in Refraction by Glasses, the thing is apparently enlarged every way.

From whence it is, that the diverse Power of Refraction in Fluids arises, is not easy to determine, tho' it would be of great Advantage if it could be discovered. Pure clear Water, of all Fluids

ids, refracts the Rays of Light the least; and if it be impregnated with Salts, it increases the Refraction in Proportion to the Quantity and Weight of the Salts dissolved in it.

The *Aqua Stygia*, or corrosive Menstruums, such as *Aqua fortis*, &c. which are Salt dissolved and rendered Corrosive by the Violence of the Fire, do yet much more refract the Sun's Rays; which need not be wondered at, because these are much denser and heavier Fluids than the former. But then why in such light fine Fluids as Spirit of Wine and other Ardent Spirit; in Oil of Turpentine, which is so light and fine a Fluid, as to be generally called, an *Ethereal Oil*; why these, I say, should produce so great a Degree of Refraction, as is known they do, is a thing of great Difficulty to account for, and well deserves a farther Enquiry into.

Dr. Gregory in his Astronomy, very well accounts for the Oval Figures which the Sun near the Horizon (especially in high Latitudes) is sometimes seen to put on from Refraction. For having before demonstrated, That because of the Earth's Atmosphere all Bodies near the Horizon, will appear something higher in the vertical Circle than they really are, and this the more, the nearer they are to the Horizon: He shews that the upper Margin of the Sun's Disk being raised a little more than it ought to be, and the lower one a great deal more, the Sun's Vertical Diameter will seem to be contracted, but the Horizontal one will not, and therefore he will appear Oval. And for the same Reason, the observed Distance of two Fix'd Stars, is sensibly less (when measured by an Instrument) if they are in the same Vertical Circle, and one of them near the Horizon, than when they both have a considerable Altitude.

After this he shews how to determine the Quantity of the Refraction in any given Degree of Altitude, and to make a Table of it; thus.

Let some Fix'd Star having no sensible Parallax, and much elevated above the Horizon, be chosen, whose Place he shews how to determine at *P. 164. Prop. 26.* by Observations made when the Star is so high as to have no sensible Refraction. Then let the Time be noted when this Star hath any known Altitude, (as taken by an Instrument) and Calculation made for the true Altitude, (according to the Star's known Place) the Excess of the observed Altitude above this is the Refraction.

REFRACTION Astronomical, is that which the Atmosphere produceth, whereby a Star appears more elevated above the Horizon than really it is.

REFRACTION Horizontal, is that which causeth the Sun or Moon to appear on the Edge of the Horizon, when they are as yet somewhat below it.

REFRACTION from the Perpendicular, is when a Ray falling, inclined from a thicker Medium into a thinner, as from Glass into Air, in breaking, departs farther from that Perpendicular.

REFRACTION to the Perpendicular, is when a Ray falling inclin'd from a thinner or more diaphanous Medium, upon a thicker or less transparent, as from Air upon Water, in breaking, comes nearer the Perpendicular, drawn from the Point of Incidence at Right Angles, on the Surface of the Water wherein the Refraction is made.

REFRANGIBLE, is whatever is capable of being Refracted.

REFRIGERATORY, is that Part of an Alembick or Distilling Vessel which is placed about the Head of the Still, and filled with Water to cool the Head of the Alembick, that the Spirituous Vapours may the sooner and the more easily condense into Drops. Cold Water must continually be put into the Refrigeratory, as the Vessel grows hot. Most Apothecaries, Distillers, &c. that have Occasion for drawing off large Quantities of Spirits, do now-a-days use the *Vesica* or Copper Body with its *Moors-Head* of the same Metal and without any Refrigerations about the Head of the Still. But there is below, a long Worm or Serpentine in a Tub of Water, where the Spirituous Vapours are very easily condensed into a Liquor. And this may as well be called a Refrigeratory as the former.

REFUTATIO *Foeth*, a Term in Civil-Law signifying the Loss of a *Feudal Tenure* by Forfeiture; which is of two Kinds, either by not performing the Service required, or by committing some villanous Act against the Lord or Sovereign.

REGALIA, the Royal Rights of a King, reckoned by the *Civilians* to be Six. 1. Power of Judicature. 2. Power of Life and Death. 3. Power of War and Peace. 4. Miterless Goods. 5. Assessments. 6. Minting of Money. Also, the Crown, Scepter with the Cross, Scepter with the Dove, St. Edward's Staff, four several Swords, the Globe, the Orb with the Cross, and such other like Things used at the Coronation of our Kings, are called *Regalia*.

REGARDANT, the Heralds Term for a Lion or such kind of Beast of Prey, born in a Posture of looking back behind him.

REGEL, or *Rigel*, a fix'd Star of the first Magnitude in *Orion's* left Foot; its Longitude is 72 deg. 19 min. Latitude 30° 10'.

REGIMENT, is a Body of Troops of Horse, or Companies of Foot, commanded by a Colonel, but the Number is as undetermin'd as that of the Men in a Troop or a Company. There are Regiments of Horse that are not above 300 Men; and there are some in *Germany* of 2000; and the Regiment of *Picardy* in *France* consists of 6000 Men.

REGIO *Assensu*, is a Writ whereby the King gives his Royal Assent to the Election of a Bishop.

REGION: *Fernelius* with some Anatomists, distinguish the Cavities of an Animal Body into several Regions or Parts, which they specify into *Publick* and *Private*. The Publick are Three. The first includes the *Vena Porta*, and all Parts to which its Branches reach. 2. The Second begins at the Roots of the *Vena Cava*, and ends in the small Veins before they become Capillary. The Third they make to contain the Muscles, Bones, and Bulk of the Body: But this is not much received. The *Aridamen* is usually distinguished also into three Regions, the *Uppermost*, *Middle*, and *Lower*.

REGION, is also taken for our *Hemisphere*, or the Space within the Four Cardinal Points of the Heavens, or of the Air, &c.

— In Geography, it signifies a large Extent of Land inhabited by many People of the same Nation, and enclosed within certain Limits or Bounds.

REGION *Elementary*, according to the *Aristotelians*, is a Sphere terminated by the Concavity of the Moon's Orb, comprehending the Earth's Atmosphere.

REGION

REGION *Aethereal*, in Cosmography, is the vast Extent of the Universe; wherein are comprized all the Heavens and Celestial Bodies.

REGIONS of the Air, are distinguished into *Upper, Middle, and Lower.*

REGISTERS, in a Chymical Furnace, are Holes purposely left in the Sides of the Furnace with Stopples to them, to let in or keep out the Air, according as the Fire is required to be greater or less.

REGIUS *Morbus*. See *Icterus*.

REGULATOR, signifies him that Buys and Sells any Wares or Victuals in the same Market or Fair, or within five Miles thereof. In the *Civil Law*, such an one is called *Dardanarius*.

REGULAR Body, is a Solid whose Surface is composed of *Regular* and *Equal* Figures; and whose Solid Angles are all equal. Such as the,

1. *Tetrahedron*, which is a Pyramid, comprehended under Four Equal and Equilateral *Triangles*.

2. *Hexahedron*, or Cube, whose Surface is composed of six equal *Squares*.

3. *Octahedron*, which is bounded by eight Equal and Equilateral *Triangles*.

4. *Dodecahedron*, which is contained under 12 Equal and Equilateral *Pentagons*.

5. *Icosihedron*, consisting of 20 Equal and Equilateral *Triangles*.

That there can be no more *Regular Bodies* besides these, may be thus proved.

1. Of Equilateral *Triangles*, there must be three at least to make a Solid Angle; and three of them joined together will make the *Tetrahedron*; for those three *Triangles* meeting in a Point, do form a Triangular Base similar and equal to the Sides; as appears by the bare Composition of the Figure. Four such *Triangles* joined together in a Point, make the Angle of the *Octahedron*.

By joining five such *Triangles* together, the Angle of the *Icosihedron* is formed.

But six such *Triangles* joined in a Point, cannot make a Solid Angle; because they make four right ones; (for every Angle of an Equilateral Triangle is $\frac{1}{3}$ of two; or $\frac{2}{3}$ of one right Angle; either of which Fractions multiplied by Six, gives four right Angles) whereas every Solid Angle is made up of four such plane Angles as all together must be less than four right ones: So that with *Triangles* 'tis impossible to form any more *Regular Bodies* than these three.

If you take *Squares* and join three of them together, they will make the Angle of a *Cube*; and there can no other *Regular Body* but a *Cube* be made with *Squares*; for four *Squares* joined together, will not make a Solid Angle, but a Plane.

If you join the Angles of three *Pentagons* together, you will constitute the Angle of the *Dodecahedron*. But four such Angles cannot make a Solid one.

And three *Hexagons* joined together, do make

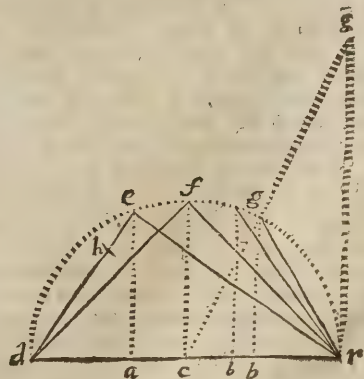
just four right Angles, and therefore they cannot make a Solid Angle. And as for three *Heptagons*, or other Figures yet of more Sides, they can much less do it; because their Angles being very obtuse, three of them will exceed four right ones. So that upon the whole, 'tis plain, that of these Five *Regular Bodies*, three are made of *Triangles*; one of *Squares*, and one of *Pentagons*, and there can be no other.

The Proportion of the Sphere, and of the Five Regular Bodies inscribed in the same; from Peter Horrigon, Cursus Matth. Vol. 1. P. 779, And Barrow's Euclid, Lib. 13.

The Diameter of the Sphere being 2.

The Circumf. of the greatest Circle	6. 28318
Superficies of the greatest Circles.	3. 14159
Superficies of the Sphere	12. 56637
Solidity of the Sphere	4. 18859
Side of the Tetrahedron	1. 62299
Superficies of a Tetrahedron	4. 6188
Solidity of a Tetrahedron	0. 15132
Side of a Cube or Hexahedron	1. 1547
Superficies of the Hexahedron	8.
Solidity of the Hexahedron	1. 5396
Side of an Octahedron	1. 41421
Superficies of the Octahedron	6. 9282
Solidity of the Octahedron	1. 33333
Side of the Dodecahedron	0. 71364
Superficies of the Dodecahedron	10. 51462
Solidity of the Dodecahedron	2. 78516
Side of the Icosihedron	1. 05146
Superficies of the Icosihedron	9. 57454
Solidity of the Icosihedron	2. 53615

If one of these Five *Regular Bodies* were required to be cut out of the Sphere of any other Diameter, 'twill be as the Diameter of the Sphere 2 is to the Side of any one Solid inscribed in the same, (suppose the Cube 1. 1547) so is the Diameter of any other Sphere (suppose 8.) to 9. 2376, the Side of the Cube inscribed in this latter Sphere.



Let dr be the Diameter of any Sphere, and da $\frac{1}{2}$ of it. $= ab = br$. Erect the Perpendiculars ae , ef , and bg , and draw de , df , er , fr , and gr .

Then

Then will

1. *re* be as the Side of the Tetrahedron.
2. *df* is the Side of the Hexahedron.
3. *de* is the Side of the Octahedron.
4. Cut *de* in extrem and mean Proportion in *b*, and *db* will be the Side of the Dodecahedron.
5. Set the Diameter *dr* up perpendicularly at *r*, and from the Centre *c*, to its Top, draw the Line *cg* cutting the Circle in *g*. Let fall the Perpendicular *gb*. So is *br* the Side of the Icosihedron.

REGULAR Figures, in Geometry, are such whose Sides, and consequently their Angles, are all equal to one another.

Whence all **Regular Multilateral Planes** are call'd **Regular Polygons**.

The Area of such Figures is speedily found by multiplying a Perpendicular let fall from the Centre of the Inscribed Circle to any Side by half that Side, and then that Product by the Number of the Sides of the Polygon.

REGULAR Fortification. See *Fortification*.

REGULAR Curves, are such *Curves* as the Perimeters of the Conick Sections, which are always curved after the same Regular Geometrical manner.

But **Irregular Curves**, are such as have a *Point of Inflexion*; and which being continued, do turn themselves a contrary way, as the *Conchoid*, and the Solid *Parabola* which hath a Square for its *Parameter*.

REGULATOR, a small Spring belonging to the Balance, in the new Pocket-Watches.

REGULUS. See *Basilicus*.

REGULUS, or *Regule*. When any Metal or Mineral is separated in a Crucible, by Purification, from its more gross and terrene Parts, the finer and metalline Parts will sink to the Bottom of the Crucible. And this the Chymists call *Rex* or *Regulus*, the Royal or Noble Part of the Mixt.

REGULUS of Antimony, is thus made. Mix together 16 Ounces of Antimony, 12 of Crude Tartar, and 6 of Salt-petre, all well powdered; then heat a large Crucible red hot, and throw into it a Spoonful of the Mixture, presently Covering the Crucible with a Tile; repeat this Spoonful by Spoonful till all the Matter is thrown in. Then make a great Fire about the Crucible, and when the Matter hath been a while melted, pour it into an Iron Mortar greased a little with Suet, and warm'd; knock the Mortar on the Side with the Pestle, to make the *Regulus* precipitate to the Bottom. When 'tis cold separate it from the Dross, then Powder it, and melt it again in another Crucible, with a little Salt-petre thrown on it when 'tis in Fusion. Cast it out as before into a greased Mortar, or mould it into Pills, Cups, &c.

For of this *Regulus* is made the *Antimonial Cup*, and the *Regulus*. If you powder four Ounces of it, and Calcine it in an Earthen Pan, unglazed, over a small Fire, stirring the Powder all the while with a Spatula; a Fume will arise; for about an Hour and half or two Hours, the Powder will turn grey, and at the End of that small Time, will Weigh near two Drams and an half, more than the Powder did at first, tho' it fumed all the time; which may satisfy us, that some Bodies have their Pores so adapted, that they can detain the very Particles of Fire themselves, and Incorporate with

them. An Augmentation of Weight happens in making the Calx of Lead, and some others, but not in such a degree, nor so soon as this.

If an Ounce of the Dross of the *Regule of Antimony*, be boiled in a Pint of Water, and then set to stand and cool without stirring it, it will coagulate into a Substance very like to Blood, but not so red.

The Chymists make much ado about a *Regulus of Antimony* made with Steel, because of a kind of Star that appears in the Bottom of it: But it hath no other Virtues than this described above. You may see the way of making it in *Lemery*, p. 265. last Edit. and in many other Chymical Authors.

If Antimony be cakined in an Earthen Pot unglazed, and continually stirring till no more Fumes arise, and afterwards the Matter be put into a Crucible, and in a very violent Fire melted and kept an Hour in Fusion, it will be turned into a reddish Opake Glass, which they call Glass of Antimony, and is a most violent Emetick.

REJOYNDER, in Law, signifies an Answer or Exception to a Replication: for first the Defendant puts in an Answer to the Plaintiff's Bill, which is sometimes called, *An Exception*, the Plaintiff's Answer to that is called, a *Rejoinder*, especially in Chancery. 'Tis by the Civilians called *Duplicatio*.

RELAIS, a French Term in Fortification, the same with *Berne*.

RELATION Inharmonical, a Term in Musical Composition, signifying a harsh Reflection of Flat against Sharp, in a cross form, viz. When some harsh and displeasing Discord is produced, in comparing the Present Note of another Part.

RELATIVE Gravity, the same with *Specifick*, which see.

RELATIVE Propositions, are those that include some Comparison, and some Relation, thus: Where the Treasure is, there is the Heart: As much as thou hast, so much art thou worth.

RELAXANTIA. See *Chalastica*.

RELAXATION, is a Dilatation of parts or Vessels.

RELEASE, in Law, is an Instrument whereby Estates, Rights, Titles, Entries, Actions, and other things, be sometimes extinguished, sometimes transferred, sometimes abridged, and sometimes enlarged; and is either in *Fact* or in *Law*.

A *Release in Fact*, is that which the very Words expressly declare.

A *Release in Law*, is that which doth Acquit by way of Consequence or Intendment of Law.

RELEGATION, in Law, signifies a Banishment for a certain time.

RELEIFE, or *Releivo*, is the Protuberant jetting or standing out of any Figures or Images above the Plain on which they are formed. And whatever Figures or Representations are thus cut, stamped, or otherwise wrought, so that not the entire Body, but only part of it is raised above the Plain, is said to be done in *Releife*; and when the Work is low, flat, and but a little raised, 'tis called *Basse Releife*, or *Low Releife*. When a Coin or a Medal hath its Figure low and thin, and hardly distinguishable from the Plain, we say its *Releife* is low and weak; but when 'tis much raised, we say 'tis Bold, and its *Releife* is Strong.

RELEVISH, in Law, signifies to let one to Mainprise upon Surety.

RELICTA Verificatio, is when a Defendant hath Pleaded, and the Issue entered of Record, and after that the Defendant *Relicta Verificatio*, (*que est son Plea*) acknowledges the Action, and thereupon Judgment is entered for the Plaintiff.

REMAINDER, in Law, is an Estate limited in Lands, Tenements, or Rents; to be enjoyed after the Expiration of another particular Estate. As a Man may let to one for Term of his Life, and the Remainder to another for the Term of his Life; and this Remainder may be either for a certain Term, or in Fee-simple, or Fee-tail; the Difference between a Remainder and Reversion, is this, That by a Reversion, after the appointed Term the Estate returns to the Donor, or his Heirs, as the proper Fountain; whereas by Remainder, it goes to some third Person, or a Stranger.

REMEMBRANCE, is when the Idea of something formerly known, recurs again into the Mind, without the Operation of the like Object on the External Senses.

REMEMBRANCERS of the Exchequer, are three Officers or Clerks there, viz. *The King's Remembrancer, the Lord Treasurer's Remembrancer, and the Remembrancer of the first Fruits.*

The King's Remembrancer enters into his Office all Recognizances, taken before the Barons for any of the King's Debts, for Appearance, or for observing Orders; and maketh out Process against the Collectors of Customs, Subsidies, and Fifteenths for their Accounts: All Informations upon Penal Statutes, are entered in this Office, and there all Matters upon *English Bills* in the Exchequer-Chamber remain: He makes the Bills of Composition upon Penal Laws, takes the Stalment of Debts, has Delivered into his Office all manner of Indentures, Fines and other Evidences whatsoever, that concern the assuring of any Lands to the Crown: He every Year in *crastino annuarum* reads in open Court, the Statute for Election of Sheriffs, and gives them their Oath: and he reads in open Court the Oath of all the Officers of the same, when they are admitted, besides many other Things.

The Lord Treasurer's Remembrancer, upon whose Charge it lies, to put the Lord Treasurer, and the rest of the Judges of that Court, in Remembrance of such Things as are to be called on, and dealt in for the King's Benefit. He makes Process against all Sheriffs, Escheators, Receivers and Bailiffs, for their Account: He makes Process of *Fieri facias* &c. *Extent*, for any Debts due to the King either in the Pipe or with the Auditors; makes Process for all such Revenues as are due to the King, by reason of its Tenures: He makes Record, whereby it appears whether Sheriffs, and other Accountants, pay their *Profers* due at *Easter* and *Michaelmas*. He makes another Record, whether Sheriffs, and other Accountants, keep their Days of Prefixion. All *Estreats* of Fines, Issues, and Amerciaments, set in any Courts at *Westminster*, or at the Assizes, or Sessions, are certified into this Office, and are by him delivered to the Clerk of the *Estreats*, to write Process upon them, &c.

The Remembrancer of the First Fruits, takes all Compositions and Bonds, for First Fruits, and Tenths, and makes Process against such as do not pay the same.

REMINISCENCE, is the Power which the Humane Mind hath of recollecting it self, or calling again to its Remembrance such Ideas or Notions which it had really forgot: In which it dif-

fers from *Memory*, which is a treasuring up of things in the Mind, and keeping them there without forgetting them.

REMISSION, is a Word used by Physical Writers, to signify the Abatement of the Power or Efficacy of any Quality, as when it is increased, they say 'tis Intended; and all Qualities are thus capable of *Intension* or *Remission*.

See in the Word *Quality*, a Demonstration that the *Intension* of all Qualities decreases, as the Squares of the Distance from the Centre of Action reciprocally.

REMITTER, in a Legal Sense, is to restore one that hath two Titles to Lands or Tenements, and is seized of them by a latter Title which is discovered to be defective, to the former and more ancient Title, that so he may continue in Quiet Possession.

RENAL Artery, is said by some, to come out of the *Aorta*, and to enter into the Kidneys, bringing to it the Serosity of the Arterial Blood.

RENALIS. See *Adiposa Vena*.

RENDER, in Law, is a Word used in levying of a Fine, which is either single, whereby nothing is granted or rendred back again by the Cognisee to the Cognisor, or double, which containeth a Grant or tender back again of some Rent, Common, or other Thing out of the Land it self to the Cognisor, &c.

Also, there be some Things in a Manner that lie in *Prender*; that is, which may be taken by the Lord or his Officer, when they change, without any Offer made by the Tenant, as Escheats, and the like; and some that lie in *Render*; that is, must be delivered or answered by the Tenants, as Rents, Reliefs, Heriots, and other Services. Also some Service consists in Seisance, some in *Render*.

RENDS in a Ship, are the same as the Seams between her Planks.

RENES, the *Reins* or *Kidneys*; there are always two of them, and placed in the *Abdomen* between the two Membranes of the *Peritonaeum*, and adjoining to the Sides of the *Aorta* and *Vena Cava*; the Right Kidney lies lower in Men, and is something less than the left: They are covered with a double Membrane; of which the outwardmost is common, proceeding from the *Peritonaeum*; and is called the *Membrana Adiposa*, from its being covered with Fat, in Fat and Corpulent People; into this the *Arteria Adiposa* enters from the *Aorta*; and the *Vena Adiposa* goes out from it, which the right Kidney usually sends into the *Emulgent Vein*, rarely into the *Cava*, but the left Kidney generally into the *Cava*. By means of this Membrane, both the Kidneys are joined to the *Loins* and *Diaphragma*: The right one to the *Cecum Intestinum*, and sometimes to the Liver, and the left is connected by it to the Spleen and Colon.

Its Interior Membrane or Tunick, and which is proper to it, is taken from the External Root of those Vessels which enter the Kidneys, (and which do enter it but with a single Coat;) and this hath some small Nerves from a Branch of the sixth Pair, and from the *Stomachick Branch*, which give the Kidneys but a dull small Sense, but afterwards branched out into the *Ureters*, render them extremely sensible; and those Nerves (by Consent of Parts) cause that Vomiting which usually accompanies Nephritick Pains. The Kidneys have two Eminent Blood Vessels, the *Emulgent Vein* and *Artery*; of which the later distributes the Blood from the

the *Aorta* into the Body of the Kidneys, and the former brings it back again.

RENES *Succenturiati*, are a Pair of Glandulous Bodies placed above the Reins or Kidneys: Their Use (by some) is supposed to be, to receive the Lympha into their Cavities, thereby to attenuate and render more fluid and capable of Circulation, the Blood returning from the Kidneys, where it hath parted with its *Serum*. But we are yet, saith Dr. *Gibson*, in the dark as to their true Use: They are called also *Glandula Renales*, and by *Bartholin* *Capsula Atrabilaria*: By Dr. *Wharton*, *Glandula ad Plexum Nervorum sita*. They are larger in Children than in Men; being in the former near as big as the Kidneys, but they do not increase proportionably as other Parts do.

RENITENCY, is that Resistance which there is in Solid Bodies when they press upon, or are impelled one against another, or that Resistance that any heavy Body makes on the Account of its Weight, to our Arm or Hand when we lift it up.

RENT, signifies a Sum of Money, or other Consideration issuing Yearly out of Lands or Tenements; of which Lawyers reckon three Sorts, *viz.* *Rent-service*, *Rent-charge*, and *Rent-seck*: *Rent-service*, is where a Man holds his Lands of his Lord by Fealty, and certain Rent, or by Fealty Service, and certain Rent, or that which a Man making a Lease to another for Term of Years, reserveth Yearly to be paid for them. *Rent-charge*, is where a Man makes over his Estate to another, by Deed indented, either in Fee, or Fee-tail, or for Term of Life, yet reserves to himself, by the same Indenture, a Sum of Money Yearly to be paid to him, with Cause of Distress for Non-payment. *Rent-seck*, or Dry Rent, is that which a Man making over his Estate by Deed indented, reserveth Yearly to be paid to him without Cause of Distress, mentioned in the Indenture.

REPARATIONE faciende, is a Writ which lies, in divers Cases, whereof one is, where three are Tenants in Common, or Joint-tenants, *pro indiviso*, of a Mill or House which is fallen to decay, and the one being willing to repair it, the other two will not; in this Case the Party willing shall have this Writ against the other two.

REPELLENT Medicines, are such Things as by stopping the Heat and Afflux of Humours, and by shutting up the Pores with their cold and binding Qualities, decrease the swelling of a Part, and drive the Humours another way.

REPETITION, (a Figure in Rhetorick) is when a Person thinking his first Expression not well understood, and is impatient to make his Hearers know what he means, repeats or explains it, another way.

REPLEADER, in Law, is to plead against that which was once pleaded before.

REPLEGIARE, signifies properly to redeem a Thing detained or taken by another, by putting in legal Sureties. See *Replevin*.

REPLEGIARE de averiis, is a Writ brought by one whose Cattle are distrained, or put in the Pound, upon any Cause by another, upon Surety, given to the Sheriff to prosecute or Answer the Action in Law.

REPLEVIN, is a Writ that lies where a Man is Distrained for Rent or other Thing, then he shall have this Writ to the Sheriff, to deliver to him the Distress, and shall find Surety to pursue his Action against the Distrainer; and if he pursue it not, or

if it be found or judged against him, then the Distrainer shall again have the Distress, and he shall have in such Case a Writ called, *Returbo habendo*. Goods may be replevied two Ways, *vizi* by Writ; and that is by the Common Law; or by Plaint, and that is by Statute Law for the more speedy having again of their Cattle and Goods.

REPLICATION, is an Exception of the second Degree, made by the Plaintiff, upon the first Answer of the Defendant: It is also, that which the Plaintiff replies to the Defendant's Answer in Chancery, which is either *General* or *Special*.

The Special is grounded upon Matter arising out of the Defendant's Answer, *et c.*

The General is so called from the general Words therein used.

REPORT, in Law, is a publick Relation of Cases Judicially argued, debated, resolved, or adjudged, in any of the King's Courts of Justice, with the Cause and Reasons of the same delivered by the Judges. Also when the Chancery, or other Court, refer the stating of some Case, or comparing an Account, *et c.* to a Master of Chancery, or other Officer, his Certificate therein is called; a Report.

REPRISALIA, the same with *Clarigatio*.

REPRISES, is commonly (in Law) taken for Deductions and Duties which are Yearly paid out of a Mannor and Lands, as *Rent-charge*, *Rent-seck*, *Pensions*, *Corrodies*, *Annuities*, *Fees of Stewards or Bailiffs*, &c. Wherefore when we speak of the clear Yearly Value of a Mannor, we say it is so much *per Annum ultra reprints*, besides all Reprises.

RFPRIEVE, in Law, is properly to take back, or suspend a Prisoner from the Execution and Proceeding of the Law for that time.

REPTILS, are all those *Creeping Animals* which rest upon one Part of their Body while they advance the other forward; as *Alders*, *Asps*, *Snakes*, *Earthworms*, &c.

RESCUIT, is an Admission, or receiving a third Person to plead his Right in a Cause formerly commenced between other two; as if a Tenant for Life or Years bring an Action, he in the Reversion comes in, and prays to be received to defend the Land, and to plead with the Demandant. The Civilians call this *Admissionem tertii pro suo interesse*.

Rescuit is also applied to an Admittance of Plea, tho' the Controversy be only between two.

RESCOUS, or *Rescus*, in Law, is a Resistance against lawful Authority; as if a Bailiff, or other Officer, upon a Writ do Arrest a Man, and others by Violence take him away, or procure his Escape, this is a *Rescus in Fact*: So, if one distrain Beasts for Damage feasant in his Ground, and as he drives them in the High-way towards the Pound, they enter into the Owner's House, and he withholds them there, and will not deliver them upon Demand, this Detainer is a *Rescus in Law*. It is also used for a Writ which lies for this Fact, called *Breve de Rescussu*. *Rescus*, in Matters relating to Treason, is Treason; and in Matters concerning Felony, is Felony.

RESCUSSOR, is he that commits such a *Rescus*.

RESERVATION, in Law, signifies a Keeping or Providing; as when a Man lets his Land, he reserves a Rent to be paid to himself for his Maintenance. Sometimes it signifies as much as an Exception; as when a Man lets a House, and re-

serves

serves to himself one Room, that Room is excepted out of the Demise.

RESIANCE, or *Residence*, signifies a Man's Abode or Continuance in one Place: And it is all one indeed with *Residence*; but that Custom ties this only to Persons Ecclesiastical.

RESIDENCE, is a Word peculiarly used both in the Common and Canon-Law, for the Continuance or Abode of a Parson or Vicar upon his Benefice.

RESIDUAL Figure, in Geometry, signifies the remaining Figure after Subtraction of a Lesser from a greater.

RESIDUAL Root, in Mathematicks, is one composed of two Parts or Members only connected together with the Sign —: Thus $a - b$, or $5 - 3$, is a *Residual Root*; and is so called, because its true Value is no more than its *residue* or difference between the Parts a and b .

RESIGNATION, is a Word used for the giving up of a Benefice into the Hands of the Ordinary, otherwise by the *Canonists* termed *Renunciation*: And though it signifies all one in Nature with the Word *Surrender*, yet it is by Custom restrained to the yielding up a Spiritual Living, and *Surrender* to the giving up of Temporal Lands into the Hands of the Lord.

RESINA, in *Pharmacy* and *Botany*, is a fat and oleaginous Liquor flowing either Spontaneously, or else let out by Incision from any Tree or Plant. It will not dissolve in Water, but in Oil only, and is easily inflammable.

RESINE, or *Rosine*, of Jalap, Benjamin, Scammony, Turbith, &c. or of any Vegetable which abounds with Resinous Particles, is thus made in Chymistry.

The Vegetable grossly Powdered, is put into a Matrafs, and then well rectified Spirit of Wine is poured on it to the Height of four Fingers above the Matter; then another Matrafs hath its Neck fitted and luted into the former to make a double Vessel; and thus the Matter is digested for 3 or 4 Days in a Sand Heat, or till it hath given a good Tincture to the Spirit of Wine: Then the Dissolution is filtrated; and two Thirds of the clear Liquor is evaporated off, the Remainder is poured into a large Vessel of Water, and it will turn into a Milk, and the *Resine* will in time precipitate to the Bottom in a white Powder. It must be wash'd and dry'd in the Sun, and it will grow hard like common *Rosine*.

RESISTENCE of the Medium, is the Opposition against, or Hindrance of the Motion of any Body moving in a Fluid; as in the Air, the Water, the Ether, &c. And *this*, together with the Gravity of Bodies, is the Cause of the Cessation of the Motion of Projectiles, &c. This *Resistance*, in Mediums which are very Dense and Rigorous, so that Bodies can there move but very slowly, is nearly as the Velocity of the moving Body: But in a Medium free from all such Rigor, as the Squares of the Velocities, *Newt. Princip.* P. 245. For by the Action of a swifter Body, there is communicated to the same Quantity of the Medium, a greater Motion, in Proportion to that greater Swiftness or Velocity; and therefore in an equal Time, (by reason of the greater Quantity of the Medium being moved) the Motion will be communicated in a duplicate Ratio: But the Resistance must always be as the Motion communicated, because Action and Re-action are equally contrary.

He found also the Thing to be true by Experiment, in a Pendulum of 10 Feet in Length; that the Resistance against a Globe or Ball moving swiftly in our Air, is nearly in a duplicate Ratio of its Velocity: But if it move Slower, a little greater than in that Proportion, P. 339.

He found also by making a Lead Bullet swing as a Pendulum in a Vessel of Water, that the Resistance of Water in Proportion to Air, is as $\frac{535}{178}$ to

Dr. Wallis hath an entire Discourse on this Subject in *Phil. Transf.* N^o. 186, where he premises as a *Lemma*, That supposing all other Things equal, the Resistance of Bodies is always proportionable to the Velocity; since in a double Degree of Velocity there is twice as much Air to be moved in the same time, &c.

As to the different Resistences which Bodies of different Figures will find in passing through any Medium, Sir *Is. Newton* proves, *Prop.* 34. *Theor.* 28.

That if a Globe and Cylinder with equal Diameters be moved according to the Direction of the Axis of the Cylinder, that the Globe's Resistance will be but half of the Cylinders.

And in the following Scholium, he shews what kind of Figure revolving round an Axis, will generate a Solid that shall move in any Medium, with the least Resistance; and gives a Hint of the Use that this may be of for *Building of Ships*.

After this, several Investigations of the Figure of a roundish Solid, which should move through a Medium with the least Resistance, were publish'd by the Marquis *Hospital*, *Bernoulli*; and very briefly and clearly by Mr. *John Craig* in the *Phil. Transact.* N. 268. Where he solves the Problem, to determine the Curve, by whose Rotation round an Axis, a round Solid shall be generated, which being moved according to the Direction of that Axis, shall have the least Resistance in any Medium.

RES Naturales: Natural Things are Three; Health, the Causes of Health, and its Effects. Others reckon Seven; as the Elements, Temperaments, Humours, Spirits, Parts, Faculties, Actions; but Elements and Temperaments belong to Natural Philosophy; Humours, Spirits and Parts, are reckon'd amongst the Causes of Health, which consist of a good Temperature, and a due Conformation; Faculties and Actions are comprehended under the Effects of Health. *Blanchard*.

RES Non-naturales: Things that are not Natural, are Six; Air, Meat and Drink, Motion and Rest, Sleeping and Waking, the Affections of the Mind, Things that are let out of, and Things retained in the Body. They are so called, because that if they exceed their due Bounds, they often occasion Diseases. *Blanchard*.

RESOLVEND, a Term in the Extraction of the Square and Cube Roots, &c. signifying that Number which arises from augmenting the Remainder after Subtraction, by drawing down the next Square Cube, &c. and writing it after the said Remainder.

RESOLUTION (in Mathematicks) is a Method of Invention, whereby the Truth or Falshood of a Proposition, or its Possibility or Impossibility is discover'd, in an Order contrary to that of *Synthesis*, or Composition: For in this Analytical Method, the Proposition is propos'd as already known, granted, or done; and then the Consequences thence deducible are Examined, till at last you come to

some known Truth or Falshood, or Impossibility, whereof that which was proposed is a necessary Consequence, and from thence justly conclude the Truth or Impossibility of the Proposition: Which if true, may then be demonstrated in a Synthetical Method. This Method of Resolution consists more in the Judgment, Penetration, and Readiness of the Enquirer or Artist, than in any Particular Rules: Tho' those of Algebra are of necessary Use, and a good Treasure of Geometry in his Head will be of great Advantage to him in all Manner of Investigations.

RESORT, or *Refort*, is a Law Word, properly used in a Writ of Tail of Coufenance, as *Descent* is in the Writ of Right.

RESPECTU computi vice-comitis habendo, is a Writ for the respiting of a Sheriff's Account, upon just Occasion directed to the Treasurer and Barons of the *Exchequer*.

RESPIRATION, *ῥαπνοῖς*, includes both In-and Expiration, and is an alternate Dilatation and Contraction of the Chest, whereby the Air is taken in by the Wind-pipe for the Accension of the Blood, and by and by is driven out again with other Vaporous Effluvioms. The Cause of Respiration does not seem to consist in the Dilatation and Contraction of the *Thorax*; as is commonly thought, but in the Contraction of the Tunic, which covers the upper Part of the *Oesophagus* and the Wind-pipe, as far as its closest Recesses. *Blanchard*.

There are many Opinions about the Uses of Respiration: Some think the chief, if not the sole Design of it, is to cool and temper the Heat of the Blood, and the Heart.

Others will have the Substance of the Air to get by Respiration into the Vessels of the Lungs to the left Ventricle of the Heart; not only thereby to cool the Blood, but also help to generate aerial Spirits. This was the Opinion of *Hippocrates*, *Aristotle* and *Galen*.

Others take, with more Probability, *Respiration* to serve for the *Ventilation* of the Blood in the Lungs, in its Passage through them, whereby 'tis disburthened of many Excrementitious Steams and Superfluous Serosities, which are carried off by the Breath in Expiration; so that the Blood may be advantageously depurated, by what is carried off by the Emunctory of the Lungs.

In the *Philos. Trans.* N^o 65, there is a very pretty Account of the Cause and Manner of Respiration, by the famous *Laur. Bellini*.

RESPIRE, a Word used in Law, for Delay, Forbearance, or Continuance of Time.

RESPIRE of Homage, is the Forbearing of *Homage*, which ought first of all to be performed by the Tenant that holdeth by *Homage*; and it had the most frequent Use in such as held by Knights-Service in *Capite*, who did pay into the *Exchequer* every fifth Term, some small Sum of Money, to be respited the doing of their *Homage*. See the *Stat. 12. Car. 2. cap. 24.* whereby this is taken away as a Charge incident or arising from *Knights-Service*.

RESPONSALIS, in Law, he who gives an Answer, is he that appears for another in Court at a Day assigned: As if *Essoigniator* came only to declare the Cause of the Parties Absence, whether Demandant or Tenant; and *Responsalis* came for the Tenant, not only to excuse his Absence, but also signify, what Trial he meant to undergo.

REST, in Musick. See *Pause*.

RESTITUTION, the returning of Elastic Bodies forcibly bent to their natural State, is called the *Motion of Restitution*.

RESTITUTION, in Law, signifies the yielding up again, or restoring of any Thing unlawfully taken from another: As also the setting him in Possessions of Lands or Tenements that hath been unlawfully disseised of them.

RESTITUTIONE extracti ab Ecclesia, is a Writ to restore a Man to the Church, which he had recovered for his Sanctuary, being suspected of Felony.

RESTITUTIONE Temporalium, is a Writ that lies where a Man being Elected and Confirmed *Bishop* of any Diocese, hath the King's Royal Assent thereto for the *Recovery* of the *Temporalities* or Barony of the said Bishoprick; and it is directed from the King to the *Escheator* of the County.

RESTRAINT, is when any Action is hindered or stopped contrary to Volition or Preference of the Mind.

RESUMMONS, in Law, signifies a *Second Summons*, and Calling of a Man to answer an Action, where the *First Summons* is defeated upon any Occasion, as the Death of the Party, or the like.

RESUMPTION, in a large Sense, signifies the taking again into the King's Hands such Lands or Tenements, as before, upon false Suggestion, or other Error, he had delivered to the Heir, or granted by Letters-Patent to any Man.

RETAINING Fee, is the first *Fee* given to any Serjeant or Counsellor at Law, whereby to make him sure that he shall not be on the contrary Part.

RETE Mirabile. In those Creatures, that have the *Glandula Pituitaria* large; (as in Calves for Instance) the two Carotid Arteries meeting about the *Sella* of the Wedge-like Bone, presently divide themselves into small Twigs, which being interwoven with (tho' not so numerous) Twigs from the internal Jugular Veins, and also with nervous Fibres from the larger Trunk of the fifth Pair of Nerves, make on each Side a notable *Plexus*, called *Rete Mirabile*. There enter into this *Rete* some Twigs also from the Cervical Arteries; and there pass out of it several Twigs into the *Glandula Pituitaria*. So that in these Creatures that Gland seems to be of the same Use to the *Rete Mirabile*, as the *Glandula Pinealis* is to the *Plexus Choroides*, viz. To separate a serous Matter from the arterial Blood. But in Man (according to most Anatomists) this *Rete* is wholly wanting; so that there passing only sometimes a Twig or two, and sometimes none, from the Trunk it self of the Carotid Artery, into the *Glandula Pituitaria*, that Gland is of less Use in him than in other Creatures that have the *Rete*. Yet Dr *Ridley* affirms, That he never found this *Rete* wanting, or with any Difficulty discoverable in Men, springing from, and lying on the Inside of each Carotid Artery: But confesses, that it is far smaller in them than in Brutes; for which Difference he thus accounts. Brutes by reason of their prone Position, would, but for this *Rete*, be in danger of having their Brains deluged as it were with an over-great Quantity of the influent Blood, and of a Rupture of the Vessels by its violent Ingress, and this Danger is so much the more threatened, by how much the same Cause which brings it into the Brain with that Force, is equally as great and effectual to hinder its proportionable

tionable return. For the Relief of which Inconvenience, Nature hath contrived a Means for its more easy and safe Descent into the Brain, by turning that one largest Stream of Blood (which through its being pent in one Channel, becomes so rapid) into many more, (by which means the Carotid Trunk above the *Dura Mater* in those Creatures, is very small to what it is beneath; whereas that Artery in Men, &c. hath the same Bigness on both Sides the Membrane) and they not only reticulated and contorted for the more flow and laborious Descent of the Blood; (which Contrivance the Ancients thought was only for a more exact Preparation of the Blood for Animal Spirits) but also many of them by their Insertion into the *Glandula Pituitaria*, attended with small Veins issuing thence, to take off some Part of the Burthen too. And that to the aforefaid Position of several Creatures ought chiefly to be ascribed the Variety of Magnitude of this *Rete* in several of them, its Size in *Dogs* seems highly to evince; in whom, by reason of their Horizontal Position, being neither so prone as several Brutes who feed on Grass, nor so erect as Man, this *Rete* is found smaller than in the first, and larger than in the last.

RETENTION, is a Faculty of the Mind, whereby it makes a farther Progress towards Knowledge.

RETICULARIS plexus, the same with *Choroides*.

RETICULUM, the same with *Omentum*.

RETIFORMIS plexus. See *Plexus Retiformis*.

RETIFORMIS tunica, is the principal Organ of Sight; being a certain Expansion of the inner Substance of the Optic Nerve in the Eye, which is to the Eye like a whited Wall in a dark Chamber, and receives and represents the visible Species that are let in by a Hole as it were into a darkened Room.

RETINA tunica, the same with *Retiformis*.

RETIRADE, in Fortification, is a kind of Retrenchment made in the Body of a Bastion or other Works, which is to be disputed Inch by Inch, after the first Defences are Dismantled. It usually consists of two Faces, which make a Re-entring Angle.

RETIRED Flank. See *Flank*.

RETORT, is an Instrument or Vessel in Chymistry, commonly of this Figure, used for Distillations of Oils and Volatile Salts, and also of Acid Spirits. 'Tis sometimes made of Glass, sometimes of Earth, and sometimes of Iron, according to the Nature of the Matter to be Distilled, and the Degree of Fire necessary to perform the Operation.

Earthen Retorts are best for the drawing of Acid Spirits, because they will bear the utmost Heat, and not Melt, as Glass ones sometimes do. Therefore when you are forced to use a Glass Retort in so strong a Fire, it must be coated or covered over with Lute. See that Word.

There is also another kind of Earthen Retorts, which are flat at the Bottom, and whose Nose or Beak turns upwards, which in great Furnaces are used for the Distillation of Acid Spirits; and they have Earthen Receivers Luted to them.

RETRACTORES Alarum Nasi, &c Elevatores Labii Superioris: These Muscles arise broad and fleshy from the fourth Bone of the Upper Jaw,



whence descending obliquely, they are soon inserted to the Upper Lip, and *Ala Nasi*. Their Name shews their Use is to lift up the Nose and Upper Lip.

RETRAHIENS Auriculam, is a Muscle by some called *Triceps Auris*, because it has sometimes 3 Beginnings. *M. du Verney* says it is composed of five or six fleshy Fibres, which have their Origination from the Superior and Forepart of the *Apophyse Mastoidea*, and descend obliquely to their Insertion in the Middle of the *Concha Auriculae*.

RETRENCHMENT, in Fortification, is a Ditch bordered with its Parapet, and secured with Gabions or Bivins laden with Earth. It is sometimes taken for a simple *Retirade* in Part of the *Rampart*, when the Enemy is so far advanced, that he is no longer to be Resisted, or beaten from the first Post.

RETROCESSION of the Equinoxes, is the Annual going backward of the Equinoctial Points about 50 Seconds. See *Equinoxes*.

RETROGRADE, in Astronomy, is usually appropriated to the Planets, when by their proper Motion in the Zodiac, they move backward or contrary to the Succession of the Signs: As from the second Degree of *Aries* to the first, &c. But this Retrogradation is only apparent, and occasioned by the Observer's Eye being placed on the Earth: For to an Eye at the Sun, the Planet will appear always Direct, and never either Stationary or Retrograde.

RETURN, in Law, hath two several Applications: The one is the *Return* of Writs by Sheriffs and Bayliffs, which is only a Certificate made to the Court, of that which he hath done touching the Execution of their Writ directed to him. And this among the *Civilians* is termed *Certificatorium*: Of *Returns* in this Signification speaks the Statute of *Westmin. 2 Cap. 39*. So is the *Return* of a Commission, a Certificate or Answer to the Court, of that which is done by the Commissioners, Sheriffs, or other, to whom such Writs, Commissions, Precepts or Mandates are directed. Also, certain Days in every Term are called *Return Days*, or Days in Bank; and so *Hilary* Term hath four *Returns*, viz. *Ostabis Hilarii, Quindena Hilarii, Crastino Purificationis &c Ostabis Purificationis*. *Easter* Term hath Five, viz. *Quindena Pasche, Tres Pasche, Mensis Pasche, Quinq. Pasche*, and *Crastino Ascensionis Domini*. *Trinity* Term hath Four, *Crastino Trinitatis, Ostabis Trinitatis, Quindena Trinitatis, Tres Trinitatis*; and *Michaelmas* Term Six, viz. *Tres Michaelis, Mensis Michaelis, Crastino Annæmarum, Crastino Martini, Ostabis Martini, Quindena Martini*. The other Application of this Word is in Case of *Replevin*; for if a Man Distrain Cattle for Rent, &c. and afterwards justify or avow his Act, so as it is found lawful, the Cattle before delivered unto him that was distrained, upon Security given to follow the Action, shall now be returned to him that distrained them.

RETURNO habendo, is a Writ that lies upon him that has avowed a Distress made of Cattle, and proved his Distress to be lawfully taken, for returning to him the Cattle distrained, which before were replevied by the Party distrained, upon Surety given to Prosecute the Action; or when the Plaintiff or Action is removed by *Recordari*, or *Accedas ad Curiam*, into the Court of *Common Pleas*, and he whose Cattle were distrained makes default, and doth not prosecute his Suit.

RETURNUM averiorum, is a Writ Judicial, granted to one Impleaded for the taking the Cattle of another, and unjust detaining them *contra Vadium* & *Plegios*, and appearing upon Summons, and is dismissed without Day, because the Plaintiff makes Default; and it lies for the return of the Cattle to the Defendant, whereby he was Summoned, or which were taken for Security of his Appearance upon the Summons.

RETURNUM irreplegiabile, is a Writ Judicial, sent out of the Common-Pleas to the Sheriff, for the final Restitution or return of Cattle to the Owner, unjustly taken by another, as *Damage-feasant*, and so found by the Jury before Justices of Assize in the Countrey, or otherwise by Default of Prosecution.

REVENUE, signifies properly the Rent that accrues to every Man from his Lands and Possessions.

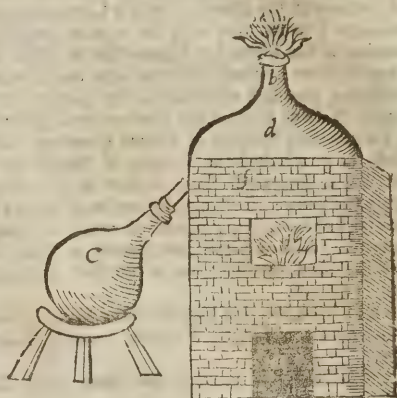
REVERBERATE: The Word signifies properly to strike, reflect, or beat back again. The Chymists say, *Make the Flame reverberate on the Coppel*. That is, Let either the Flame of the Wood be so blown with the Bellows, as that it may be beaten back down on the Metal; or else make the Sides of the Furnace so close all about, that the Flame striking against its Sides, may be beat back again down on the Matter to be melted. For which latter Purpose they have a Particular Furnace called the

REVERBERATORY Furnace; which is a strong fix'd Furnace of two Bricks thickness, and must be large enough to hold a Retort, or more than one, for the Distillation of Acid Spirits, and other Things. The Mortar or Lute for such a Furnace is usually one Part Potters Earth, as much Horse-dung, and two Parts of common Sand kneaded in Water. The Ash-hole must be about a Foot high, and the Door contrived, if possible, so as that the Air may come freely to it, to light the Fire the more easily, or to increase the Flame. The Fire-place need not be quite so high: At the top of it are two Iron Bars placed cross-wise, to set the Retort on; and then the Furnace is rais'd about a Foot higher, to cover or close the Retort: Then is there fitted to this a *Dome* or Cover with its Chimney, which is set on the top of the Dome on a little Hole, which when the Chimney is not used, hath a Stopple to it: This Dome may be made of the same Paste that portable Furnaces are usually made of; which see under *Furnaces*.

And one may make according to his Fancy, Room, or Convenience, a Furnace of this Kind; and there is no need of keeping exactly to this Form, especially as to the Dome, which in a large Reverberatory may be made with Tiles or Bricks placed over the Retorts, and plaistered over with a Lute made of Ashes, melted with common Water.

Here follows the Figure of Mr. Lémery's Reverberatory, which will serve to give an Idea of the former Description.

- a The Ash-hole;
- b The Fire-Place;
- c The Dome or Cover;
- d The Chimney;
- e The Receiver;
- f The Retort.



Such a Furnace as this, will also serve for many Uses, as well as Distilling *per Reverberarium*; as to Distil with the Refrigeratory, in *Baineo*, &c. for the Copper Body may be placed on the Bars, and the Vessel holding the Water, Sand, Ashes, &c. as a little Practice will soon teach the Young Chymist.

REVERSED Talon. See *Talon*.

REVERSION, in Law, hath a double Acceptation, one is, *Jus revertendi cum status possessionis defecerit*, and this is but an Interest in the Land, when the Possession shall fall.

Secondly, When the Possession, and Estate which was parted with for a Time, ceaseth, and is determined in the Persons of the Alienees, Assignees, Grantees, or their Heirs, or effectually returns to the Donor, his Heirs or Assigns whence it was derived.

The Difference between a *Reversion*, and a *Remainder*, is, that a *Remainder* is general, and may remain to any Man, but to him that granteth or conveyeth the Land, &c. for Term of Life only, or otherwise. A *Reversion* is to himself, from whom the Conveyance of the Land, &c. proceeded, and is commonly perpetual, as to his Heirs also. And yet sometimes *Reversion* is confounded with *Remainder*.

REVIEW, A Bill of Review in Chancery, is where a Cause hath been heard, and the Decree signed and enrolled; and some Error in Law appears upon the Decree made, which Bill cannot be exhibited, but by License of the Court.

REVIVE, when any mix'd Body is restored again to its Natural Form and Condition, from out of the Disguises it was in, by being mixed with some other Body, they say it is *Revived*.

Thus when Mercury is distilled from Cinnabar, they call it Mercury revived from Cinnabar; because the Mercury was made into Cinnabar only for safety and convenience of its being carried from Place to Place. See *Mercury*.

BILL of REVIVER, is where a Bill hath been exhibited in *Chancery*, against one who answers, and before the Cause is heard, or if heard, before the Decree enrolled, either Party dies: In this case a *Bill of Reviver* must be brought, that the former Proceedings may stand revived, and the Cause be finally determined.

REVIVING, in Law, signifies a renewing of Reits and Actions after they be extinguished.

REVOLUTION, in Astronomy, is the Circulation of any Celestial Body, till it return to the same Point in which it was when it first began to move. But,

REVOLUTION, or as some call it, The *Restitution* of the *Animals*, is the Return of a Planet to any one Point of its Eccentrick, after it hath parted from it.

REVULSORIA, *V. S.* is whereby the Blood that gushes upon one part, is diverted a contrary way, by opening of a Vein in a remote and convenient place. This our Surgeons call frequently Bleeding for a *Revulsion*.

RHABDOLOGY, is the Art of computing or numbering by those Rods, commonly called *Neper's Bones*; which see.

RHACHITIS, is according to some, the Spinal Marrow; (which see in its proper place;) Also a Disease common amongst the *English*, which is an unequal Nourishment of the Body, accompanied with Looseness of Parts, Softness, Weakness, Faintness, Drowsiness, a great swelling Head, with Leanness below the Head; with Protuberances about the joints, crookedness of Bones, straitness of the Breast, swelling of the *Abdomen*, stretching of the *Hypochondres*, a Cough, &c. The *English* call it the *Rickets*: But because the occasion of it often lies in the Spinal Marrow, the Famous *Glysson* calls it appositely enough *Rhachitis*. *Blanchard*.

RHAGADES, the *Latins* say *Scissure*, *Fissura*, *Rima*, Chinks, Clefts, which as they happen in other parts of the Body, Hands, Feet, Lips, the entrance of the Womb; so they may happen in the Fundament, in the Extremity of the Gut *Rectum*, and in the *Sphincter*, or Muscle, which closes the Fundament. *Rhagades* in the Fundament are certain oblong little Ulcers, without swelling, like those which are sometimes occasioned in the Hands by great Cold. Some are superficial, others deep: Some are not hard nor callous, others are: Some are moist, and send forth Matter, others dry and cancrous. *Blanchard*.

RHEGMA, is a breaking forth or bursting of any part, as of a Bone, the inner Rind of the Belly, the Eye, &c.

RHEUMATISM, is a wandering Pain in the Body, often accompanied with a small Fever, Swelling, Inflammation, &c. *Blanchard*.

RHEXIS, the same with *Rhegma*.

RHINENCHYTES, is a little Syringe to inject Medicines into the Nostrils.

RHOMBE Solid, is two equal and right Cones joined together at their Bases.

RHOMBOIDES, so called from its Figure, is a pair of Muscles of the Scapula, proceeding from the two lowermost Vertebres of the Neck, and from the four upper Spinal Processes of the Vertebres of the Back: By and by they descend obliquely, and being fleshy at the beginning and end, go as far as the Basis of the Shoulder-blade, which they move backward and obliquely upward; It adheres strongly to its Subjacent Muscle the *Serratus Superior Posticus*.

RHOMBOIDES, a Figure in Geometry! See *Quadrilateral Figures*.

RHOMBUS. See *Quadrilateral Figures*.

RHUMBS. See *Rumbs*.

RHYOS, a Disease of the Eyes, caused by a consuming or diminishing of the Caruncle, or small piece of Flesh in the great corner of the Eye, so that it can no longer contain its Liquor. *Blanchard*.

RHYPTICA are Scouring Medicines which cleanse away Filth. *Blanchard*.

RHYTHMUS, is a certain Proportion of Pulses, Time, Life, Age, &c. *Blanchard*.



RIBBON, a Term in Heraldry, signifying the eighth part of a Bend; it is born a little cut off from the out-lines of the Escutcheon, thus.

He beareth On a Ribbon, Gules.

RIBBS of a Ship, are the Timbers of the Planks when the Planks are off; so called, because they are bending like the Ribs of a Carcase.

Those little long wooden Pieces also which belong to the Parrels of the Yards, and have holes in them like the Comb under the Beak-head, are called the Ribbs of the Parrels.

Ride, a Ship is said to Ride, when her Anchors hold her fast, so that she drives not away by the force of the Wind or Tide; and a Ship is said to Ride well, when she is built so that she doth not over-beat her self into a Head Sea, as that the Waves over-rake her, (that is over-walk her) from Stern to Stern. They say also a Ship

RIDES a-crofs, when the Rides with her Main yards and Fore-yards hoisted up to the Hounds; and both Yards and Arms topped alike. She is said to

Ride a Peek, when one end of the Yard is pecked up, and the other hangs down: And this is also said of a Ship, when in Weighing she is brought directly over her Anchor. She is said to

RIDE Atwart, when her Side is to the Tide. And to

RIDE betwixt Wind and Tide, when the Wind hath equal force over her one way, and the Tide another; but if the Wind hath more Power over her than the Tide, she is said to *Ride Wind Rode*. She is said to

RIDE Hawseful, when in a Stress of Weather she falls so deep into the Sea with her Head, that Water runs in at her *Hawser*. She is said to

RIDE Portise, when her Yards are struck upon the Deck, or when they are down *Aport-last*.

RIDEAU, in Fortification, is a Ditch, the Earth whereof is raised on its Side, or a small elevation of Earth, extending it self in length on a Plain, which serves to cover a Post, being also very convenient for those that would besiege a Place at a near distance; and to secure the Workmen in their Approaches to the Fort of a Fortress.

RIDERS in a Ship, are great Timbers both in the Hold and also Aloft, which are bolted on to other Timbers to strengthen them, when 'tis discovered a Ship is too weakly built.

RIENS Arreare, is a kind of Plea used to an Action of Debt upon *Arrearages* of Account, whereby the Defendant does alledge, There is nothing in *Arrear*.

RIENS passe par le fait, is the Form of an Election taken in some Cases to an Action.

RIENS

RIENS *per descent*, is a Form of Pleading when an Heir is sued for a Debt of his Ancestor, and he hath no Assets in his Hand, nor any Lands liable to be extended.

RIGGING of a Ship, is all her Ropes whatsoever belonging to her Masts or Yards, or any Part about her.

A Ship is well Rigged, when all her Ropes are of their fit size in proportion to her Burden. She is said to be over-rigged when her Ropes are too big for her; which wrongs her much in her Sailing, and is apt to make her *Heel*.

RIGHT, in Law, signifies not only a Right for which a *Writ of Right* lies; but also any Title or Claim, either by virtue of a Condition, Mortgage, or the like, for which no Action is given by Law, but only an Entry.

Thus is *Jus Proprietatis*, a Right of Propriety: *Jus Possessionis*, a Right of Possession: And *Jus Proprietatis & Possessionis*, a Right both of Property and Possession, and this was formerly called, *Jus duplicatum*: As if a Man be disseised of an Acre of Land, the Disseisee hath *Jus Proprietatis*; the Disseisor hath *Jus Possessionis*, and if the Disseisee release to the Disseisor, he hath *Jus Proprietatis & Possessionis*.

Right-angled, a Figure is said to be Right-angled, when its Sides are at Right-angles, or stand Perpendicularly one upon another: And this is sometimes in all Angles of the Figures, as in Squares and Rect-angles: Sometimes only in part, as in Right-angled Tri-angles.

Right-angled Tri-angle. See *Tri-angle*.

Right-Angles. See *Angles*.

RIGHT-ascension, of the Sun or Star, is that Degree of the *Equinoctial*, accounted from the beginning of *Aries*, which riseth with it in a *Right Sphere*.

Or, it's that Degree and Minute of the *Equinoctial* (counted as before) which cometh to the Meridian, with the Sun or Stars, or with any Point of the Heavens. The reason of which referring it to the Meridian, is because that is always at Right Angles to the *Equinoctial*; when the Horizon only is in a *Right* or *Direct Sphere*.

To find the Sun's or Star's *Right Ascension*, by the *Globe*.

Bring the Sun's or Star's Place to the Meridian, and the Number of Degrees intercepted between the beginning of *Aries*, and that Degree of the *Equinoctial* which comes to the Meridian, is the *Right Ascension*, if required in Time: Account every 15 Degrees to be an Hour, and every Degree to be 4 Minutes.

To find the Sun's *Right Ascension Trigonometrically*; having his greatest Declination and Distance from the next *Equinoctial* Point given; say,

As Radius is to the Co-sine of the Sun's greatest Declination :: So is the Tangent of his Distance from the next *Equinoctial* Point to the Tangent of the *Right Ascension*.

Example.

Let the Sun's Distance from the next *Equinoctial* Point be 30 Degrees 00 Minutes; his greatest Declination be 23 Degrees 30 Minutes.

Then to the Co-sine of 23° 30' ——— 9. 962398
Add the Tangent of 30° 00' ——— 9. 761439

Sum less Radius is the Tan. of 27° 53' 19. 723837

Which is the *Right Ascension* required.

The same may be also found, by having the present Declination, (suppose 11 Degrees 30 Minutes) and the greatest Declination 23 Degrees 30 Minutes given.

For, As the Tangent of the Sun's greatest Declination, is to the Tangent of his present Declination :: So is the Radius to the Sine of his *Right Ascension*.

The Operation stands thus:

To the Ar. co. of the Tan. of 23° 30' — 0. 361698
Add the Tangent of 11° 30' ——— 9. 38463

Sum adding the Radius = S. 27° 53' — 19. 670161

RIGHT or *Direct Sphere*, is that which has the Poles of the World in its Horizon, and the Equator in the Zenith: The Consequences of living under such a Position, (as those who live directly under the Line are in) is that they have no Latitude, nor Elevation of the Pole. They can see nearly both Poles of the World; all the Stars do Rise, Culminate, and set with them. And the Sun always rises and descends at Right Angles to their Horizon, and makes their Days and Nights even; because the Horizon bisects the Circle of his Diurnal Revolution.

To find the *Right Ascension* of a Planet, or Star that hath Latitude, use this Proportion.

As Co-sine of the Stars Declination is to the Co-sine of its Distance from the next *Equinoctial* Point :: So is the Co-sine of its Latitude, to the Co-sine of its *Right Ascension*.

RIGHT the Helm, a Sea Phrase, used by him that Commands to the Man at Helm, ordering him to keep the Helm even with the Middle of the Ship.

RIGHT Line, is the nearest Distance between any two Points. See *Line*.

RIGHT Muscles of the Head. See *Rectus Internus Major & Minor*.

RIGHT Sailing, is when a Voyage is performed on some one of the four *Cardinal Points*.

If a Ship sail under the Meridian; that is, on the North or South Points, she varieth not in Longitude at all; but only changeth the Latitude, and that just so much as the Number of Degrees she hath run.

If a Ship sail under the *Equinoctial*, upon the very East or West Points, she altereth not her Latitude at all, but only changeth the Longitude, and that just so much as the number of Degrees she hath run. If the Ship sail directly East or West under any Parallel, she there also altereth not her Latitude, but only the Longitude; yet not according to the Number of Degrees of a great Circle she hath sailed, as under the *Equinoctial*; but more

more than so many, according as the Parallel is remoter from the Equinoctial towards the Pole: For the less any Parallel is, the greater is the Difference of Longitude.

RIGHT *Sine*, the same with *Sine*; which see.

RIGOR, is a Vibration and Concussion of the Skin, and Muscles of the whole Body, accompanied with Chills.

RIGOROUS way of explicating Rarefaction is, as it is called by the Moderns, that which is made use of in the Peripatetic School; which see under *Rarefaction*.

RIM, in a Watch or Clock, is the Circular part of the Balance thereof.

RING *Dial*. See *Universal Equinoctial Dial*.

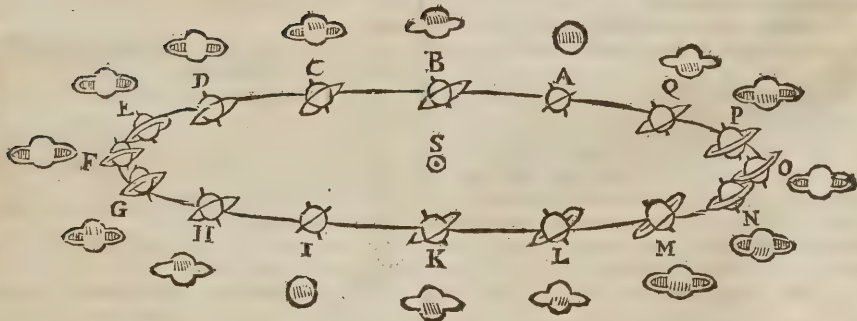
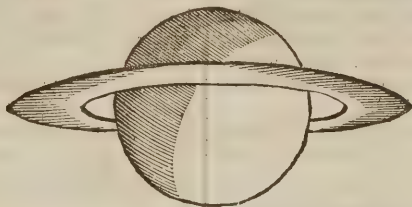
RING of *Saturn* is an Opaque Solid, Circular Arch and Plane, like the Horizon of a Globe, of Matter entirely encompassing round the Planet, and no where touching it; its Plane is at this Time nearly parallel to the Plane of our Earth's Equator: The Diameter of this Ring is $2\frac{1}{2}$ of *Saturn's* Diameters, and the Distance of the Ring from the Planet, is about the breadth of the Ring itself.

Galileus first discovered the Figure of *Saturn* not

to be round; but that the Inequality was thus in the Form of a Ring, Mr. *Hugens* first found out and published in his *Systema Saturniana*, 1659. 'Tis this Ring, and its various Positions in respect of the Sun, (whose Light it reflects like the Body of *Saturn* itself) and of the Eye of the Spectator, which occasions all the various Appearances of *Saturn* with his *Anse* (as they call them) or with none, with broad, or narrow ones, &c.

The following Figures which I borrowed from Dr. *Gregory's* Astronomy, will very well illustrate this Matter.

The first is a single Figure of the Planet, when his Ring is most visible: And the second explains the several Phenomena of the Ring in all its Positions, in respect of the Sun at S. during the Planet's entire Revolution round the Sun. When the Planet is at A or I, the Ring is scarce visible, because the Sun's Rays running almost parallel to it, can illuminate it but very sparingly. But when *Saturn* is at E. or N. then the Sun's Rays falling almost directly upon the Ring, do render it most of all conspicuous.



RIOT, in Law, signifies the forcible doing of an unlawful thing, by three or more Persons assembled together for that purpose.

RISING of the Sun or Star, is their appearing above the Horizon.

The *Rising of the Sun* may be found by the Globe; thus.

First rectify the Globe (which Word see;) then bring the Sun's Place to the East part of the Horizon; and the Hour Index will shew the Time either before or after Six.

The Time of the Sun's Rising doubled, gives the Length of the Day.

The *Rising of any Star*, may be thus found by the Globe.

Rectify your Globe and Hour Index; bring the Star to the East, and the Index will shew the Time of the Star's Rising.

Rising *Timbers* in a Ship, are the Hooks placed on her Keel; and are so called, because as these rise in Proportion, so her Rake and her Run rise on her flat Floor by degrees.

The **RISINGS** in a Ship, are those thick Planks which go fore and aft, on both Sides under the End of the Beams and Timbers of the Second Deck unto the third Deck, half Deck, and quarter Deck; and on them the Beams and Timbers of the Deck do bear at both ends, by the Ship's side.

RISUS Sardonius, is a Contraction of each Jaw, or a Convulsive kind of Grinning, caused by a Contraction of the Muscles on both sides of the Mouth. *Blanchard.*

RIVERS and *Springs*; whence they arise, see under the Word *Vapour*.

A **Road**, is in any place near the Land where the Ships may Ride at Anchor, and a Ship riding there is called a *Roader*.

ROB. See *Apothefima*.

ROBBINS in a Ship, are those small Lines which make the Sail fast to the Yards, being reeved into Eylet-holes in the Sail under the Head-rope; for that purpose. The Word is, *Make fast the Robbins*: For at Sea they don't say *tie*, but *make fast*.

ROD, a Measure of Length containing by Statute just 16 $\frac{1}{2}$ Feet *Englsh*. See *Pole*. This must carefully be distinguished from *Rood*, which is a Square Measure containing the fourth part of an Acre.

ROLL, in Law, signifies a Schedule of Paper or Parchment, which may be turned or wound up with the Hand to the Fashion of a Pipe; of which there are in the Exchequer several Kinds: As, *The great Wardrobe Roll*, *the Cofferer's Roll*, *the Subsidy Roll*, &c.

Roll of Court, the Court Roll in a Mannor, wherein the Names, Rents, and Services, of the Tenants were copied and enrolled.

RIDDER-roll; the Court *ex officio*, may award a *Certiorari ad informandum conscientiam*; and that which is certified shall be annexed to the Record, and is called a *Ridder-roll*.

Or a *Ridder-roll*, is a Schedule, or small piece of Parchment, added to some part of a Roll or Record.

ROLLS, or the Office of the Rolls in *Chancery-Lane*, formerly called *Domus Conventorum*, is the House that was built by King Henry the Third, for Jews converted to the Christian Faith; but Edward the Third expelled them for their Wickedness, and deputed the Place for the Custody of the Rolls and Records of the *Chancery*, the Master whereof is the Second in Chancery, and in the Absence of the Lord Chancellor or Lord Keeper, sits as Judge, being commonly called *the Master of the Rolls*.

ROLLS of Parliament, the Manuscript Registers or Rolls of the Proceedings of our old Parliaments. For before the use of Printing, and till the Reign of Henry the Seventh, our Statutes were all engross'd in Parchment, and (by virtue of the King's Writ to that purpose) proclaimed openly in every County.

In these Rolls we have a great many decisions of difficult Points in Law, which were frequently in former times referred to the Determination of this Supreme Court, by the Inferior ones of both Benches, &c.

ROMAN Indiction. See *Indiction*.

ROMAN Order of Architecture, is the same with the *Composite*. 'Twas invented by the Romans in the Time of Augustus, and set above all the others, to shew (say some) that the Romans were Lords

over all other Nations: 'Tis made up of the *Ionick*, and *Corinthian Orders*, and is more Ornamental than either.

ROMPEE, in Heraldry, they call a *Chevron* so; when it is born of this Figure.



He beareth a *Chevron Rompee*, between three Mulletts, Or, by the Name of *Sault*.

RONDEL, in Fortification, is a Round Tower sometimes erected at the Foot of the Bastions.

ROOD, a Square Measure containing just a Quarter of an Acre of Land: Some confound this Measure with a *Rod*, which is the Length of 16 $\frac{1}{2}$ Feet; and others with a Yard Land, or the *Quartona Terra*, but both very erroneously.

A *Rood* is sometimes called a *Fartbendele*.

ROOF-trees, or *Ruff-trees*, are the Timbers in a Ship, which go from the *Half-Deck* to the *Fore-Castle*: They serve to bear up the Gratings, and are supported by *Stanchions*. Also that Piece of Timber which on Occasion is laid over the *Half-Deck* to bear up Nettings, Sails, or Pieces of Canvass, is called a *Rlof-tree*.

ROOT, whatever Quantity being multiplied into its self Produces a Square, and that Square again being multiplied by that first Quantity Produces a Cube, &c. is called a *Root*, as either the Square, Cube, or Biquadrate *Root*, &c. according to the multiplication. See *Square*, *Cube*, &c. Also the Unknown Quantity in an Algebraick Equation is often called the Root. And what are the Determine number of Roots in any Cubick, or Biquadrate Equation, Mr. Halley shews in *Philos. Trans.* N. 100.

ROPES, of a Ship are in General all her Cordage; But Particularly they call by this Name only,

1. The *Entring-rope* which hangs at the Ladder to help People up the Side.
2. A *Top-rope*, so called, because belonging to the Top.
3. A *Bolt-rope*, into which the Sail is fowed.
4. A *Buoy-rope*, which is that to which the Buoy of the Anchor hangs.
5. The *Guest-rope*, which tows the Long-Boat.
6. The *Keel-rope*.
7. The *Bucket-rope*, which serves to heave the Bucket in drawing Water.
8. The *Rudder-rope*, which reaved into a Hole of the Rudder near the Head, and also through the Stern-post, both the Ends thereof are spliced together, serving to save the Rudder, if by any Accident it should be beaten off.

Also the *Preventer-rope*, which is a small Rope, seized cross over the Ties, close at the Ram-head; so that if any one part of the Tie should be broke, yet the Remainder should not run through the Ram-head, to endanger the Yard.

There is also a Rope called a *Breast-rope*, which Lashes the Parrels to the Masts.

And another called the *Guy-rope*, which is reeved through a Block, fastned by a Strop, to the Head of the Fore-mast, and having its end fastened to the Strop of the Winding Tackle, to bowle it forwards, that it may plumb directly over the Hatch Way.

And there is also a *Boat-rope*, by which the Boat hangs, or is fastened a Stern of the Ship.

ROPE yarn, is the Yarn of any Rope untwisted: 'Tis commonly made of Cable Ends which are Worn out, which are called Junks of the Cables: The Use of it is to serve small Ropes, to make Sinner Mats, &c. also to make Knetties, which are 2 of these Rope Yarns, untwisted, together: Also it helps to make Caburns, i. e. Lines to bind Cables withal; and to fasten the Sails to the Yard Arms, &c.

RORIFERUS Ductus, the same that *Ductus Chyliferus*.

ROS, in the Account of the Ancients, was the First Moisture that falls from the Extremities of the Vessels, and is dispersed upon the Substance of the Members. *Ros*, says *Galen*, is a Thin sort of Moisture whereby the Parts of our Body are nourished, and is contained in all the Parts of an Animal, like a certain Dew sprinkled upon them. *Blanchard*.

ROS Vitrioli, according to *Ang. Sala*, is the first Phlegm or Water that is distilled from Vitriol in *Bainco Marie*.

ROSA, the same that *Erysipelas*.

ROSIMES, of Vegetables how made. See *Refine*.

ROSTRIFORMIS Processus. See *Coracoides*.

ROSTRUM, in Chymistry, is the Nose of an Alembick.

ROTA Aristotelica, is the Consideration of a Wheel moving along a Plain, till it hath made one entire revolution: For then will its Centre have described a Line equal to that of the Circumference of the Wheel, and so will all lesser Concentric Circles. See an *Explication of this in Boyle* against *Linus*.

ROTATOR Femoris Exprossum. See *Obturator Externus*.

ROTATOR Major & Minor, are two *Apophyses* in the upper Part of the Thigh-Bone, called *Trichanteres*, in which the Tendons of many Muscles are terminated.

ROTULA, the same that *Mola genu*.

ROTULÆ. See *Tabellæ*.

ROTUNDUS, (See *Musculus*) is a Muscle of the Radius, serving to turn the Palm of the Hand downwards.

ROUND, is a Military Term, signifying a Walk or Turn, which an Officer attended with a Few Soldiers, takes in a Garrison or Fortified Place during the Night, to observe whether the Centries do their Duty, or not.

ROUND-house, is the uppermost Room or Cabin on the Stern of the Ship where the Master lies.

ROUND-in, or *Round-ast*, a Term at Sea belonging to the Main and Fore-sail: When the Wind largeth, they say, *Let rise the Main-tacks, or the Fore-tacks! Haul ast the Fore-sheet to the Cat-head; and the Main-sheet to the Cubbridge-head! And when these Sheets are thus haled down they keep them from flying up with the Passarado-rope*. This Work is called, *rounding in*, or *rounding ast the Sail*.

ROWLE in a Ship, is a round piece of Wood or Iron, wherein the Whip goes, being made to turn about, that it may carry over the Whip the easier from side to side.

ROWSE in the Cable, or *Rowse in the Hawser*, is a Word of Command at Sea, when a Cable or

Hawser lies too slack in the Water, and they would have it be made more *taught*; left on the turning of the Tide, the Cable should happen to be foul of the Anchor.

ROYAL Assent, is that *Assent* which the King gives to a thing formerly done by others, to the Election of a Bishop by Dean and Chapter; which given, then he sends a Special Writ for the taking of *Faalty*.

And also to a Bill passed in both Houses of Parliament; which *Assent*, in Parliament, being once given, the Bill is endorsed with these Words, *Le Roy le veult*, i. e. *It pleases the King*: But if he refuses to agree to it, then thus; *Le Roy S'avisera*, i. e. *The King will Advise*.

ROYAL Fort. See *Fort*.

ROYAL Parapet, or, *Parapet of the Rampire*, in Fortification, is a Bank about three Fathoms broad, and six Foot high, placed upon the Brink of the *Rampire*, towards the Country, to cover those who defend the *Rampire*.

RUBIGO, or *Mildew*, is a Disease happening to Plants, caused by a *Dewy Moisture* which falling upon them, and continuing there for want of sufficient Heat of the Sun to draw it up, doth by it's Sharpness, or Acrimony, corrupt the Inmost Substance of the Plant.

RUBRICA. See *Impetigo*.

RUCTATION, or Belching, is a depraved Motion of the Stomach, occasioned by an Effervescence there, whereby Vapours and Flatulent Matter are sent out at the Mouth. *Blanchard*.

RUDDER of a Ship, is a Piece of Timber hung on the Stern-posts by 4 or 5 Iron Hooks (called *Pivots*) and is as it were the Bridle of a Ship; because by it she is turned about at the Pleasure of him that stands at the Helm. A Narrow Rudder is best for a Ship's sailing, provided she can feel it; that is, be guided and turned by such a Rudder. For a Broad Rudder will hold much Water, when the Helm is put over to any side: But yet if a Ship have a *Fat Quarter*, so that the Water cannot come quick and strong to her Rudder, she will require a Broad Rudder. The aftermost Part of the Rudder is called, the *Rake of the Rudder*.

RUDDER-iron, are the Cheeks of that Iron, whereof the Pintle is part, which is fastened and nailed down about the Rake of the Rudder.

RUDDER-rope. *Vide Rope*.

RUGITUS, is an Effervescence of Chyle and Excrements in the Blood, whereby Wind and several other Motions are excited in the Guts, and rowl up and down the Excrements, when there's no easie Vent upwards or downwards. *Blanchard*.

RULE of Falshood. See *Position*.

RULE of Three, or the *Rule of Proportion*; or as it is called, from its excellent Use, *The Golden Rule*, is that which teaches to find a Fourth Number, which shall have the same Proportion to one of the three Numbers given, as the others have to one another.

This *Rule of Three* is, 1. *Direct*. 2. *Indirect*. 3. *Double-Rule Direct*. 4. *Double-Rule Indirect*.

Rule of Three Direct finds a fourth Number in such Proportion to the Third, as the second is to the first; or, as the first is to the second, so is the third to the fourth: Thus.

1 : 2 :: 3 : 6

This Rule requires (and is to be known thus : That if the second Term be greater or less than the first, the fourth Term shall be likewise greater or lesser than the third.

Or in the Question, if more require more, or less require less, then use this Rule *Direct*, and Multiply the second and third Terms together, and divide the Product by the first Term, the Quotient gives the fourth Term required.

Note, That the first and third Terms, and the second and fourth, are of the same Denomination : As if the first be of Money, Weights, or Measures, &c. so shall the third ; and so as the second, the fourth.

Example,

If 4 Yards cost 8 s. What will 6 Yards cost ?

Answer, 12.

y. s. y. s.
For 4 : 8 :: 6 : 12.

Here (according to the Rule $8 \times 6 = 48$, which divided by 4, gives 12 required.

Observe, That the Term which makes the Question, is to be set in the third place, and that which is of like Name with it, set in the first place, and the Numbers remaining set in the second, of whole Nature the Number sought must always be.

In this Rule, if you Multiply the second and third Terms together, the Product shall be equal to the Product of the first Term multiplied by the fourth ; which may very well serve for a Proof, if required.

RULE of Three Indirect, or the *Backward Rule*, is known by being contrary to the *Direct* ; for whereas the former required, that more shall have more, and less less ; as if 4 Yards cost 2 s. 8 Yards will cost more than 2 s. because it is double to 4 Yards, and so must the Answer be double to 2 s. that is 4 s.

But in this Rule, more will require less, and less more ; as, if 4 Horses in 6 Days eat 10 Bushels of Oats, 8 Horses will eat 10 Bushels in a fewer quantity of Days, viz. in 3. Here 10 Bushels being common is omitted, and the Question stands thus :

4 : 6 :: 8 : 3

Here the third Term contains the first, as often as the second doth the fourth : Therefore the Product of the first and second divided by the third, gives the fourth,

As $\frac{4 \times 6}{8} = 3$, that $\frac{24}{8} = 3$ the fourth Term required.

The *Double Rule of Three*, both *Direct* and *Indirect*, may be comprised in one Rule, with two Operations only.

1. Observing, That the given Terms are always five, whereof three are Conditional and Antecedents,

or Suppositions, the other two demand the Question, and are Consequents answering some of the former Antecedents ; inasmuch, that with the Answer there will be as many Consequents as Antecedents, which must match one another in the same Denomination exactly.

2. For the right placing of the Question and Terms, the three Terms of the Conditional part are duly to be regarded : Let that which is the Principal Cause of Loss or Gain, Increase or Decrease, Action or Passion be put in the first place ; and that which betokeneth the space of Time, Distance of Place, &c. be put in a second Place ; and the remaining part in the third. The Conditional part thus stated, the other two Terms wherein the Demand lies, must be placed so under the former Terms, that they may correspond one with another.

R U L E I.

Then, If the *Blank* or Place sought, fall under the third Term, Multiply the three last Terms for a Dividend, and the two first for a Divisor, and the Quotient gives the sixth Term required.

R U L E II.

But, If the *Blank* fall under the first or second Terms, Multiply the first, second, and fifth Terms for a Dividend, and the third and fourth for a Divisor, the Quotient gives the Answer.

Example 1.

If 12 Rods of Ditching be done by 2 Men in 6 Days, how many Rods shall be wrought by 8 Men in 24 Days ?

Answer, 194.

State your Numbers according to the former Direction, they'll stand thus ; the Blank under the third place.

Men.	Days.	Rods.
2	6	12
8	24	

Therefore (by the first Rule) $12 \times 8 \times 24 = 2304$ for the Dividend, and $2 \times 6 = 12$ for the Divisor ; the Quotient 194 gives the Answer.

Example 2.

If 2 Men work 12 Rods in 6 Days, how many Men will work 192 Rods in 24 Days ?

Answer, 8.

Your Terms being rightly placed, the Blank will fall under the first Term thus,

Men.	Days.	Rods.
2	6	12
	24	192

Here

Here $2 \times 6 \times 192 = 2304$ is the Dividend, and $12 \times 24 = 288$ is the Divisor, and the Quotient 8 is the Answer.

RUMB, or *Course of a Ship*, is the Angle which she makes in her Sailing with the Meridian of the Place where she is.

Complement of the Rumb, is the Angle made with any Parallel to the Equator by the Line of the Ship's run.

RUMB, in Navigation, is on Point of the Compaſs, or $11\frac{1}{4}$ Degrees, viz. the $\frac{3}{4}$ part of the Circumference of the *Horizon* or *Compaſs Card*, which is the Repreſentative of the *Horizon*.

RUMB-Line, is a Line deſcribed by the Ship's Motion on the Surface of the Sea, Steered by the Compaſs, making the ſame or equal Angles with every Meridian.

There *Rumbs* are *Helispherical* or *Spiral Lines*, proceeding from the Point where we ſtand, winding about the Globe of the Earth till they come to the Pole, where at laſt they loſe themſelves.

But in the *Plain* and *Mercator's Charts*, they are repreſented by ſtrait Lines. Their Uſe is to ſhew the bearing of any two Places one from another; that is, upon what Point of the Compaſs any Shore or Land lies from another.

RUMINANT Animals, are ſuch as chew the Cud.

RUMINATION, is the Action of chewing the Cud in ſome Adimals. *J. Con. Peyerus* hath Written a Tract, *De Ruminantibus & de Ruminatone*, Printed at *Baſil*, in 4to. In which he takes Notice, That ſome Animals do really and truly chew the Cud; ſuch as Oxen, Sheep, Deer, Goats of all Kinds, Camels, Hares, and Squirrels; which therefore generally have 3 Stomachs, the *Panuch*, the *Feck*, and the *Read*. But thoſe which ſeem only to imitate that Motion, he calls *Ruminantia Spuria*; ſuch as the Mole, Cricker, Bee, Beetle, Crab, Lobſter, Mullet, and ſeveral Birds. And theſe he affirms to have all of them their Stomachs composed of Muſcular Fibres, by means of which, they do as it were grind and work their Meat up and down ſomething like *Ruminating Creatures*. He defines.

Rumination to be a Natural Motion of the Stomach, Mouth, and other Parts, which relieve one a-

nother in this Action; by which means, the Meat eaten haſtily at firſt, is conveyed back to the Mouth again, there Chewed, and then Swallowed down a ſecond time, to the great Advantage of the Animal.

RUN of a Ship, is ſo much of her Hull as is always under Water, growing thinner and lankier by degrees from the *Floor Timbers* to the *Stern Poſt*. This is alſo called her *Way afterwar'd on*; and they ſay a Ship hath a good Run when 'tis long, and that the Water paſſes cleverly to her Rudder, her Tuck nor lying too low, which is of great Importance to her Sailing; for if the Water don't come ſtrongly to her Rudder, by reaſon of her being Built too broad below, ſhe can never Steer well; and a Ship that can't Steer well, can't keep a good Wind, and will have no freſh way through the Sea, but will be ſtill falling to Lee-ward; and therefore can never be a good Sailor. Nevertheless a Ship with a large and good Run, will loſe much Stowage, becauſe ſhe is narrow below.

RUNDLES, or *Roundels*, the ſame as Balls or Bullets, which ſee. 'Tis a Word uſed in Heraldry.

RUNG-Heads, which are made a little bending; to direct the Sweep or Mold of the *Futtocks* and *Naval Timbers*; for here the Lines which make the Compaſs and Bearing of a Ship, do begin.

RUNGS, the ſame with the *Floor* or *Ground-Timbers*, being the Timbers in a Ship which conſtitute her Floor, and are bolted to the Keel, whoſe ends are *Rung-heads*.

RUNNER, is a Rope belonging to the *Garnet*, and to the two Bolt-tackles, viz. That before which comes in the aftermoſt Shrouds of the Fore-Maſt, and that abaft which comes in the foremoſt Shrouds of the Main-Maſt.

This *Runner* is reeved in a ſingle Block which is ſeized to the end of a Pendant, and has at the one end a Hook to hitch into any thing, and at the other end a double Block, into which is reeved the fall of the Tackle or the *Garnet*, by which means it doth Purchase more than the Tackle or *Garnet* can do alone. The Word is *Overhale the Runner*; that is, bring down that end which has the Hook to it, that it may be hitched into the Sling, &c.

RAYS, is a too plentiful and preternatural falling of Tears.



SABLE; the Heralds Word for a Black Colour in the Arms of Gentlemen; but in those of the Nobility, they call it *Diamond*, and in the Coats of Sovereign Princes, 'tis called *Saturn*.

'Tis expressed in engraving by strokes drawn perpendicularly across each other.

SACCHARUM Saturni. See Salt of Saturn.

SACULI Medicinales, are when several Simples, according to the Nature of the Disease, are compounded and beaten together, and tied up in a little Bag, to be applied to the Part affected. This Bag is to be sewed or quilted down in several places, that the Ingredients run not altogether in a Lump. *Blanchard*.

SACCULUS Chyliferus or *Roriferus*, is what we usually call the *Receptaculum Chyli*, or the common Receptacle of the Chyle; and sometimes *Receptaculum Pecquetianum*, from *Pecquet*, who first found out both it and the *Ductus Thoracicus* (whose beginning it is) in the Year, 1651. I mean he was the first that assigned the true use unto them, but both were observed in Horses by *Bartholomæus Eustacius*, above 130 Years ago, as appears in a Book he writ, 1564. pag. 301. of the *Vena sine pari*, wherein he has these Words, (ascited by *Dr. Wharton*)

From this notable left Trunk of the Throat, (viz. the Subclavian Vein) there springs a great Branch, which besides that it has a Semi-circular Door, (or Valve) in its Origin, is moreover white, and full of watry Humour; and not far from its rise it is divided into two, that after a little space, unite again into one, which sending forth no Branches, descends by the left side of the Vertebrae; and having passed thro the Midriff, runs down the middle of the Loins: Where becoming larger, and folding about the great Artery, it has an obscure ending, which I have not as yet well discovered.

Here we have a clear Description of them, only that it is the beginning which he takes for the end: And contrarily, it is called the common Receptacle, because it receives both the *Chyle* and *Lympha* promiscuously, tho' some call it the Receptacle of the *Chyle*, in particular, but without reason; for it might as well be called, *Receptaculum Lymphae*, as *Chyli*; for that the *Lympha* passes not only with the *Chyle*, but after this is all distributed, the *Lympha* still continues to glide into it, and to ascend by the *Ductus Chyliferus Thoracicus*, which might as well be called *Lymphaticus* for the same reason.

It is seated under the Celiac Artery, and Emulgent Veins, about the middle Distance between the Kidneys and Capsule atrabilariae, upon the Vertebrae of the Loins, but for the most part, rather toward the left side.

Pecquet and *Casp. Bartholin* say, 'Tis seated betwixt the Tendon (or Appendices) of the *Diaphragma*; by the Motion whereof, it is pressed and milked, as it were, and its Contents propelled. It is of a Membranous, but thicker Substance

in Men than in Brutes, but not so capacious, seldom being so large as to admit one's Fingers end. Out of it there springs a Duct that presently ascends up into the *Thorax* (behind the descending Trunk of the *Arteria magna*) where it begins to be called, *Ductus Thoracicus*; but according to *Sylvius* it might more fitly be called *Spinalis*, seeing it runs along the inside of the *Spina Dorsi*.

This Duct having past the *Abdomen* and the *Midriff*, marches farther upward under the great Artery, till about the fifth or sixth Vertebra of the *Thorax*, where it turns a little aside from under it to the left Hand; and so underneath the Intercoastal Arteries and Veins, and the Gland *Thymus*, it ascends to the left Subclavian Vein, into whose lower side it opens, just there where the left Jugular Veins enters into it on the upper side, so that their Mouths face one another. But it opens not into this Vein with any large Orifice, but by six or seven little ones, which are all cover'd in the Cavity of the *Subclavia* with one broad Valve, looking towards the Cava from the Shoulder, whereby there is granted to the *Chyle* and *Lympha* a free Passage out of the *Ductus Chyliferus* into the *Subclavia*, but their return (or of Blood with them) out of the Vein into the Duct, is prevented.

This Duct ending thus in the Subclavian Vein, the *Chyle* that it conveys into it, passes with the Blood (returning by the Cava) into the right Ventricle of the Heart, where we will leave it to supply the Defect of the depauperated Blood; having only observed, that this Duct has many Semilunar Valves that hinder the ascending *Chyle* and *Lympha* from gliding back again; which Valves are manifest by this, that the *Chyle* contained in the Duct may easily by the Finger be pressed upwards, but by no means downwards; or if one make a hole in it, the Liquor tending from beneath upwards, will flow out at it; but that which is above it, is so stoppt by the Valves, that it cannot be made to descend by it.

SACCULUS Cordis. See *Pericardium*.

SACCUS, is with some Writers the Gut called *Rectum*.

SACER Ignis. See *Herpes Exedens*.

SACER Morbus. See *Epilepsia*.

SACER (Musculus) which may be also called *Transversalis Lumborum*. It lies under the Tenuous part of the *Longissimus Dorsi*; it is a fleshy not only from the *Os Sacrum*, but also from all the transverse Processes of all the Vertebrae of the Loins, and is inserted to their Superior Spines. We have sometimes observed, (saith *Mr. Cowper*) a *Spinalis Lumborum*, like the *Spinalis Colli*, which arising from the Superior Spines of the *Os Sacrum*, and marching with direct fleshy Fibres, is so inserted to the Superior Spines of the Vertebrae of the Loins: The *Transversalis Lumborum* lying under it, helps to move the whole Spine, or Vertebrae of the Neck, Back and Loins, obliquely backwards, as in looking behind us, &c.

SACCER. See *Saker*.

SACKS of Earth, used in Fortification; are made of coarse Cloath, the largest of them being about a Cubick-foot wide, and the lesser somewhat

what more than half a Foot. They are serviceable upon several occasions, more especially for making Retrenchments in haste, to place on Parapets, or the Head of the Breaches, &c. or to repair them when beaten down. They are of good use also when the Ground is rocky, and affords not Earth to carry on Approaches, because they can be easily brought on and carried off: The same Bags on occasion, are used to carry Powder in; of which they hold out about 50 Pound a piece.

SACRAMENTO *recipiendo, quod vidua Regis, non maritabit sine licentia Regis*, is a Writ or Commission to one, for taking of an Oath of the King's Widow, that she may not Marry without the King's Licence.

SACRE. See *Saker*.

SACRILEGIUM, Sacrilege, or an Alienation to Lay-men, and to profane or common purposes, of what was given to Religious Persons, and to Pious Uses. Our honest Fore-fathers were very tender of incurring the Guilt and Scandal of this Crime. And therefore when the Order of the Knights-Templars was dissolved, their Lands, &c. were all given to the Knights Hospitallers of Jerusalem, for this sacred Reason: *Ne in plus usus erogata contra donatorum voluntatem in alios usus distraberentur*.

SACROLUMBALIS, is a Muscle of the *Thorax*, which with the *Dorsi Longissimus*, have their Origin in Common: Externally they are Tendinous as they spring from the Posterior part of the Spine of the *Os Illium*, and Superior Spine of the *Sacrum*, and all the Spines of the *Vertebrae* of the Loins: Internally it arises fleshy, not only from those parts, but from the Transverse Processes of the last named *Vertebrae*; whence with direct Fibres ascending before it matches over the last Rib, it's divided into 2 fleshy Bodies; the outermost of which is called *Sacrolumbus*, whose Fibres ascend directly, and make so many thin Tendons as there are Ribs to whom they are inserted, which are joined with so many Accessory Muscles, arising from each Rib, and united with them, before their Insertions; as they pass over the Superior: And this Order or multiformed Disposition of it, is continued the whole length of the *Thorax*, to the third, fourth, fifth and sixth *Vertebrae* of the Neck; which superior part is by *Diemerbroeck* made a distinct Muscle, and called, *Cervicalis descendens*.

SACRUM *Os*: The *Os Sacrum* is the broadest of all the Bones of the Back, and doth sustain all the other *Vertebrae*: On the inside it is smooth and hollow, on the outside convex and uneven, being of something a triangular shape. In its upper part on each side it is knit firmly to the *Ossa Ilii*, by an inverting Cartilage. It consists of five or six Bones, plainly distinguishable in Infants, but more obscurely in grown Persons. These Bones have the Resemblance of (and are usually called) *Vertebrae*; for each of them have a Body and Processes, and a large hole to receive the *Spinalis Medulla*. The Bodies of these differ from those of the other *Vertebrae* in this respect; that whereas in those the lower part is always bigger, in these it is the less; by which means the uppermost is the biggest, and the lowest the least. Their smaller holes which serve for the ingress and egress of the Vessels, differ also from those of the other, in that they are not in their sides, but before and behind; of which those before are much the larger. As for their Processes, the Oblique can hardly be discerned, except in the

first. The Transverse are pretty long, but so united, that all seem but one. The hinder, or Spines, are like those of the Loins, but less, and still the lower the lesser; inasmuch that the lowest hath no Process, but only a round Protuberance.

SAFFRON of Gold. See *Aurum Fulminans*.

SAFFRON of Steel, or Mars, See *Crocus Martis*.

SAGITTA, a Constellation in the Northern Hemisphere, consisting of 8 Stars.

SAGITTA, in Botany, signifies the upper part of any small Twig, Cyon, or Graft of a Tree.

SAGITTA, in Mathematicks, is the same as the *Versed Sine* of any Ark, and is so called by some Writers, because 'tis like a Dart or Arrow standing on the Chord of the Ark. See *Versed Sine*.

SAGITTALIS Sutura, or *Veruculata*, is that Suture of the Skull, which begins at the *Coronal Suture*, and ends in the *Lambdoidal Suture*.

SAGITTARIUS, is the Ninth, in the Order of the 12 Signs of the *Zodiac*.

To **SAIGNER** a Moat, is to drain the Water by Subterraneous Conveyances, to the end that Hurdles laden with Earth, or a Bridge of Bulrushes, may be afterward laid upon the Mud that remains, and the Passage thereby consolidated.

SAIL: Every Yard in a Ship hath its proper Sail to it, and it takes its Name from the Yard: As the *Main-sail*, is that which belongs to the *Main-yard*: The *Fore-top Sail*, is that which belongs to the *Fore-top-mast Yard*, &c. *Head Sails*, are such as belong to the *Fore-mast* and *Bolesprit*: These are used to keep a Ship from the Wind, and to star her. *After Sails*, as the *Main-mast* and *Mission Sails* do keep a Ship to the Wind.

Few Ships can steer on a quarter Wind with one Sail, but require a *Head Sail* and an *After Sail* both, one to countermand the other: Tho' some Ships can steer with their *Main-top Sail* only.

The *Mission Sail* is cut by the Leech twice as deep as the Mast is long, from the Hounds to the Deck: And the *Sprit-Sail* is $\frac{2}{3}$ of the Depth of the *Fore-Sail*.

SAILING. See *Plain*, and *Mercator's Sailing*.

SAKER, a sort of Cannon, is either *Extraordinary*, *Ordinary*, or *least Size*.

SAKER Extraordinary, is 4 Inches Diameter at the Bore, 1800 Pound Weight, 10 Foot long, its Load 5 Pounds, Shot 3 Inches $\frac{1}{2}$ Diameter, and something more than 7 Pound $\frac{1}{4}$ Weight; its level Range is 163 Paces.

SAKER Ordinary, is a size lesser, 3 Inches and $\frac{1}{2}$ Bore, 9 Foot long, 1500 weight, its Charge 4 Pounds of Powder, Bullets Diameter 3 Inches $\frac{1}{2}$, Weight 6 Pounds; level Range 160 Paces.

SAKER the least Size, is 3 Inches $\frac{1}{2}$ Diameter at the Bore 1400 Pound weight; 8 Foot long, its Load near 3 Pound $\frac{1}{2}$, Shot 4 Pound $\frac{1}{2}$ weight, and 3 Inches $\frac{1}{4}$ Diameter.

SALAMANDERS Blood, is a foolish Term that the Chymists give to the red Vapours, which in Distillation of Spirit of Nitre, towards the latter end, do fill the Receiver with red Clouds; they are the most fix'd and strongest part of the Spirit; and nothing but Nitre yields a red Vapour in Distillation.

SAL Armoniack, is either *Natural*, which is found in some Parts of *Africa*, near the Line; or *Artificial*, which is made thus.

Five parts of Urine, one of Sea Salt, or *Sal Gemme*, and half an one of Chimney Soor are boiled together.

together into a Mafs, which Mats, being after this put into a fubliming Pots, over a gradual Fire, it fublimes into the Form of that Salt, which is the common *Sal Armoniack*. It is purified by Diffolution in Water, Evaporation, &c. As other Salts.

Equal Parts of this Salt, and common Salt decrepitated, are mingled, and then the Armoniack is fublimed from the Mafs, which is called, *Flowers of Sal Armoniack*. If inftead of Sea Salt, you fhould ufe Filings of Steel, the Flowers would be yellow, and they are a little more penetrating than the former.

SAL Circulatus Paracelfi, the fame with the Alkaleft.

SAL Polychrestum, is a Preparation of Salt-petre made by burning equal Parts of it with Sulphur in a Crucible, whereby 'tis deprived of its Volatile Parts.

They give it this Name from the *Greek πολύχρηστον*, as being good for many Ufes. Tho' 'tis indeed no very good Medicine, and unlefs it be very white, ought not to be ufed.

They give it as a Purge, from half a Dram to fix Drams; but there are to many other good Purgative Medicines, that there is no need of ufing this.

SAL Prunelle, is only purified Salt-petre, having fome of its moft Volatile Parts feparated from it, by burning upon it when melted in a Crucible over the Fire, about a 30th part of its weight of Flour of Brimftone. 'Tis given to cool and provoke Urine in Fevers and Quinfies; but Salt-petre purified three or four Times, is certainly a much better Medicine; for this burning of Sulphur upon it, carries off a good part of the fine and volatile Parts, and inftead of opening it, renders it more fix'd.

They often adulterate *Sal Prunelle* with Alum, but you may diftinguifh it by its over whitenefs, and glittering too much. This is fometimes called, *Lapis Prunelle* and *Chryftal Mineral*.

SAL Volatile Oleofum, or an *Aromatick Volatile Salt* is made, by putting to every Ounce of Volatile Salt of *Sal Armoniack* diffilled with Salt of Tartar, and dulcified with Spirit of Wine, about a Dram and an half of fome *Aromatick Oil* or *Eſſence*, drawn from one or more noble odoriferous Vegetables; as Cinnamon, Cloves, Roſemary, Balm, &c. and after the Spirit and Oil are well ftirred and incorporated together, the Volatile Salt and Spirit is drawn off in a Cucurbit.

Some mingle all together, viz. the *Sal Armoniack*, *Sal Tartari*, Spirit of Wine, and the Powder of Cinnamon, Cloves, &c. at firft, and then diftill off the Volatile Salt and Spirit all at once; but the former is the beft way.

The *Sal Volatile Oleofum*, is a well known and noble Medicine; 'twas firft invented by *Sibius de la Boe*; 'Tis a great Cephalick and Cordial, and is much beyond any of the Volatil Parts that are not Aromatized.

SALIENT Angle, a Term in Fortification. See *Angle*.

SALIENT, the Term in Heraldry for a Lion in a leaping Poſture, and ſtanding ſo that his right Fore-foot is in the Dexter chief Point, and his hinder left Foot in the Sinifter baſe Point of the Eſcutcheon, by which 'tis diftinguiſhed from *Rampant*.

SALIQUE Law, *De terra Salica nulla portio Hereditatis mulieri veniat, ſed ad virilem Sexum tota*

terra hereditas perveniat, &c. was an ancient Law made by *Pharamond* King of the *Franks*; part of which ſeems to have been borrowed by our *Henry the Firſt*, in compiling his Laws, as *cap. 89. Qui hoc fecerit ſecundum Legem Salicam moriatur*.

SALIVA, or Spittle, is a Liquor ſeparated by proper Ducts (which they call the *Ductus Salivales*) from the Glands of the Mouth, as the *Parotides*, the *Glandule Nuttiane*, the *Maxillares*, the *Sublinguales*.

'Tis probable that the Origin of the *Saliva*, is from the Arterious Blood; for as the Arteries pour Nutritious Blood into all other parts, ſo they do into the Glands alſo; part of which they convert into the own Nouriſhment, part is returned by the Veins in the circulation, and part (viz. of what is ſerous) they ſeparate, and beſtowing a ſubacid quality thereupon, make *Saliva* (or Spittle) of it.

To the Compoſition whereof (if not for the Separation of it) ſome think a Nervous Juice is contributed, the rather becauſe larger and more numerous Twigs of Nerves are communicated to the Glands, than to more other parts, which yet have a more exquisite ſenſe than theſe.

But in refutation of this Opinion, the above-mentioned *Dr. Nuck* alleges this Experiment.

That if the Nerve that runs to any Gland, be either hard tied or cut in ſunder, yet the Secretion of the *Saliva* will not thereupon ceaſe, but will onely proceed more ſlowly; which ſlowneſs may be attributed not to the want of any conſtitutive Principle of the *Saliva*, ſo much as to the want of that Motion in the Gland (that to be ſure depends as well upon the Nerves as upon the Pulſation of the Artery) which is neceſſary for the quicker diſpatch of the *Saliva*, through or out of the Gland.

The manner of the Secretion of the *Saliva*, is like that of the Liquor of all other Glands, and proceeds from the Conformity of the Particles of the Liquor to the Pores in the Gland, or the Mouths of the Excretory Veſſel.

After its Separation, its Motion into and along the Salival Ducts is much farthered by the Muſcular Motion of each part reſpectively.

Now the *Saliva* is not to be reputed a meer Excrement, for it is believed by all Modern Anatomiciſts, that it ſerves for the farthering of the Fermentation of Meats in the Stomach, if it be not the main Ferment of it.

That it has a fermentative Quality *Diemerbroeck* proves by this Experiment: That if a piece of white Bread be chewed and moiſten'd with much Spittle, and then be mixed with Wheat-paſte kneaded with warm Water, it will make it ferment.

Dr. Nuck thinks it an Univerſal Ferment for Meats and Drinks, partaking of Divers Qualities (or Particles) but of none in any exceſſive Degree. That it is Acid he demonſtrates by this familiar Obſervation.

" That if when Milk is a boiling, one take a Spoonful to taſte of, and then preſently whiſt it is moiſt with the *Saliva*, put it into the Milk again (ſtill a boiling) the Milk will break as if ſome Acid Liquor were mixed with it.

That it is endued with a Volatile Salt, he thinks is evident from its curing the Itch, Tetters, &c. That Oleous Particles are mixed with the acid, he ſuppoſes muſt be concluded from its killing Quickſilver: And whereas it uſually becomes frothy in the Mouth, upon its being agitated by the Motion

of the Muscles of the Tongue, and those which move the lower Jaw, and that he thinks proceeds from its being endued with a Lixivial Salt and Spirituous Oleous and acid Particles, (while the Volatile Spirit vanishes.)

SALIVATION, is an Evacuation of Spitte by Salivating Medicines, of which fort principally are Mercurial Preparations.

SALLY, in the Art of War, is the Term for the issuing out of the Besieged from their Works, and falling upon the Besiegers to cut them off, and to destroy their Works.

SALT, the first of the three Hypostatical, but the third of the five Chymical Principles: Its two Essential Properties seem to be, *Dissolubility in Water*, and a pretty *Pungent Sapor*, being an active incombustible Substance; they say it gives all Bodies their Consistence, and preserves them from Corruption, and occasions all the Variety of Tasts.

There are three Kinds of Salts: *Fix'd Volatile*, and *Essential*.

The *Fix'd Salt* is thus drawn: The Matter is first calcined, and then the Ashes are boiled in a good deal of Water, that the Salt may be the better dissolved: After this the Solution is filtrated, and all the Moisture evaporated, and then the Salt remains in a dry form at the bottom of the Vessel. This *Fix'd Salt* so drawn, is called a *Lixivious Salt*, because a kind of *Lixivium*, or Lye, was made of the Ashes of the Body calcined.

Volatile Salt, is that which is drawn from the Bodies or Parts (chiefly) of Animals, and from some fermented, or rather purified parts of Vegetables: It rises quick and easily, and is the most Volatile of any Bodies so called.

The *Essential Salt* is drawn from the Juice of Plants by ChrySTALLIZATION: How, see *Essential Salt*.

Mr. Boyle reckons three other Kinds of Salts, viz. *Acid*, *Urinous*, and *Lixiviate*: Seethose Words. And he discovers whether any Liquor contains an Acid Salt, or no, by dropping some of it on Syrup of Violets, for then it will turn it red; but if it turn it green, it is either of an *Urinous* or *Lixiviate* Nature: To distinguish which, he drops some of it into a Solution of Sublimate made in common Water; then if a white or milky colour be produced, he concludes it to belong to the Tribe of *Urinous Salts*; but if it produce a yellow or orange colour, he judges it to be of a *Lixiviate* Nature.

SALT Common, its Spirit how drawn, see *Spirit of Salt*.

Mr. Boyle proves this Principle producible by Art, as well as other. See *Sceptical Chymist*, Part ult. p. 1.

SALT of Saturn, *Saccharum Saturni*, or Sugar of Lead, is the Body of that Metal opened and reduced to the Form of a Salt by distilled Vinegar.

Thus any of the Calxes of Lead, as suppose *Ceruse*, is powdered, and distilled Vinegar is poured upon it to four Fingers height above the Matter, an Ebullition will follow, but without sensible heat it must be digested in a Sand-heat, two or three Days, and stirred often: Then pour off the Liquor by Inclination, and digest more distilled Vinegar with the *Ceruse*, and more after that till you have dissolved about half the Matter, mix all the Impregnations together in an Earthen or Glass Vessel; evaporate the Matter in a Sand-heat, till a small Skin or Pellicle, begin to arise upon the Surface, after which, place the Vessel in a cool place, there

will appear white Chrystals: Take them out, and evaporate again as before, and let the Vessel to cool to gain the rest of the Salt: Continue this till you have gotten all; then dry the Chrystals in the Sun; and keep them in a Glass. 'Tis chiefly used outwardly for Discales of the Skin; but sometimes 'tis given inwardly, from two to four Grains at a Dose in Quinies, &c.

SALT of Steel. See *Vitriol of Mars*.

SALT of Sulphur, a Preparation in Chymistry; improperly so called, since it is only a *Sal Polychrestum* impregnated with Spirit of Sulphur, and then reduced to an Acid Salt by Evaporation of all the Moisture. Some say this is a great Febrifuge.

SALT of Tartar, is made either by powdering what remains in the Retort after the Distillation of Tartar; or else by calcining bruised Tartar wrapped up in a Paper, till it turn white. Either of these must have a great deal of hot Water poured upon them to make a *Lixivium*, then the Liquor is filtrated and evaporated in a Sand-heat, till the *Fix'd Salt* remain at the bottom of the Vessel. This is the Alkali, or *Fix'd Salt* of Tartar. If it be exposed to the Air a few Days in an open Vessel in a Cellar, or some such moist place, it will melt or run into a Liquor; and this the Chymists call Oyl of Tartar *per Deliquium*.

SALTIER, the Name of one of the Ordinaries in Heraldry, of the Form of St. Andrew's Cross.

They tell you, that anciently 'twas the Figure of an Engine, which being stuck full of Pins, was used in the Scaling of the Walls of a Besieged Place.

Pearl a Saltier Ruby, the Coat of my Lord Macklesfield.

The *Saltier* is often counterchanged with the Field, and sometimes quarterly quartered, &c.

SALVA guardia, is a Security given by the King to a Stranger, fearing the Violence of some of his Subjects, for seeking his Right by Course of Law.

SALVATELLA, is that Vein which from the Veins of the Arm is terminated in the little Finger.

SANATIVE Waters, are the Mineral Waters of any kind, such as the *Chalibiate* ones of Tunbridge, the *Vitriolick* ones of Epsom, &c.

SANDARACHA, is by some Chymists the Term for red Arsenick; 'tis called also *Realgal*.

SANGUIFICATION, is the turning of the Chyle into Blood; which is performed in all the parts of the Body, and not as the Ancients imagined in some particular parts, as the Heart, Liver, &c.

SANGUINE, the Herald's term for the Colour usually called *Murvy*, being made of Lake, with a little *Spanish Brown*; 'tis represented in Engraving by Hatches like *Purple*: 'Tis mostly used in the Coats of Knights of the Bath. When 'tis born by Nobles, 'tis call'd *Sardonix*; and in the Coats of Sovereign Princes they call it *Dragon's Tail*.

SANIES, is a thick and bloody Pus or Matter, issuing out of a Wound or Sore.

SAPHÆNA, is the Vein of the Leg, or Crural Vein, it goes down under the Skin of the Thigh and Leg, accompanied with a Nerve which loes it self at the inner Ankle; it turns towards the upper part of the Foot, where it gives several Branches, of which some go to the great Toe.

SAPHA



SAPHATUM, is a dry Scurf in the Head. See *up Wounds with Flesh*, such as by their moderate Heats, and cleansing Qualities keep Wounds and Ulcers free from Filth, and preserve the Natural Temper of the Parts, so that the Aliment easily supplies the Solution of the Parts. *Blanchard.*

SAPONEA, is a Lambative made of Almonds. *Blanchard.*

SAPORIFICK Particles, are such as by their Action on the Tongue occasion that Sensation which we call Taste or Sapor. The manner of which, see in *Taste*.

SAPOROUS, are such Bodies as are capable of yielding some kind of Taste when touch'd with our Tongue; but those that afford no Taste, are called *Insipid*.

SAPPE, in Fortification, formerly signified the undermining, or deep digging with Pick-axe and Shovel at the Foot of a Work to overthrow it without Gun-powder: Now it is used to signify a deep Trench carried far into the Ground, and descending by Steps from top to bottom; so that it covers the Men sideways; and to save them from danger on the top, they use to lay a-crois it Madriers, that is, thick Planks; or Clugs, that is, Branches of Trees close bound together, and then they throw Earth over all, to secure them from Fire. When a Covert-way is well defended by Musketers, the Besiegers must make their way down into it by *Sappe*.

SARCOCELE, is a kind of Rupture, which consists in a fleshy Excrecence of the Testicles. *Blanchard.*

SARCOLIPLOCELE, a fleshy Rupture, or Protuberancy of the *Omentum*, either about the Navel, or in the Cods.

SARCOMA, is a fleshy Excrecence in the Nostrils, and chiefly in the lowest part of the Nose, where it is fleshy, without any shape, but like the proud Flesh of an Ulcer. *Blanchard.*

SARCOMPHALUM, is a fleshy Excrecence of the Navel. *Blanchard.*

SARCOTICKS, are those Medicines which fill

up Wounds with Flesh, such as by their moderate Heats, and cleansing Qualities keep Wounds and Ulcers free from Filth, and preserve the Natural Temper of the Parts, so that the Aliment easily supplies the Solution of the Parts. *Blanchard.*

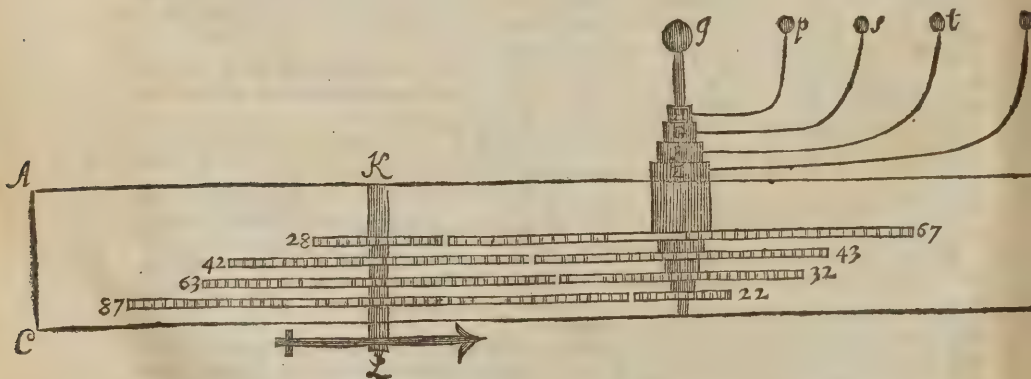
SARDONIAN, or *Sardonick Laughter*, is an Involuntary Laughter, or rather a Convulsive Distortion of the Muscles of the Mouth, in which the Patient appears to Laugh.

SARPEDO. See *Lichen*.

SARRASIN, in Fortification, is a kind of Portulicace, otherwise called a *Hersa*, which is hung with a Cord over the Gate of a Town, or Fortrefs, and let fall in case of a Surprise.

SARTORIUS, a Muscle of the Leg, which receives this Denomination from the Use Taylors make of it, in bringing one Leg and Thigh over the other, to fit cross-leg'd. It is also called *Longissimus Femoris*, it exceeding the rest of the Muscles of that Part in length; and *Fascialis* from its passing over the Muscles of the Thigh and Leg like a Swathe. It ariseth sharp and fleshy from the fore-part of the Spine of the *O. Ilium*, clost by the *Membranosus*, and descending obliquely inwards above the *Musculus Rectus*, and *Vastus Internus*, and over part of the *Tibiceps*, of an equal breadth or Thickness, meets with the *Gracialis* below the middle of the Thigh internally, and descending with it becomes Tendinous in its Passage over the Internal and Inferior Head of the Thigh-bone, (under a strict Inclosure of the *Fascia Lata*) and is inserted four Fingers breadth below the superior part of the *Tibia* internally: Its Use is declared above.

SATELLITE Instrument of Mr. *Romer*, Mathematician to the French King, as its Description was sent in a Letter to Mr. *Flamsteed*, A. D. 1679. and since published in the *Artificial Clock-maker*, in the Figure annexed.



AB and *CD*, represent the Upper and Lower Plates of the Instrument.

KL, is an Axis or Spindle on which 4 Wheels are fixed, and which turn round with it, and with the Hand *L*: once in 7 Days.

EFGH, are Sockets or hollow Arbors of 4 Wheels running concentrically, or one within another.

The hollow Arbor *H*, carrieth round the *First Satellite p*, and belongeth to the Wheel or Pinion 22, which is driven by the fixed Wheel 87.

The hollow Arbor *G*, carrieth round the *Second Satellite s*, and belongeth to the Wheel 32, which is driven by the Wheel 63.

And the like of the Arbors *F* and *E*.

Within all these hollow Arbors is another fixed one included; on the top of which, is a Ball.

(*f*) representing the Planet *Jupiter*; round which the *Satellites* move, represented by the little Balls *p s t q*.

This

This *Satellite Instrument* may be added to a Watch, by causing the great Wheel, or Dial-Wheel, to drive round the Arbor *K L*, once in 7 Days.

And this Instrument may be of good use both at Sea and Land, to assist in finding the Longitude by *Jupiter's Satellites*; partly by giving notice when an approaching Eclipse is, that we may be ready with a Telescope to observe it; and partly when any Eclipse happeneth, to shew which *Satellite* it is that is Eclipsed, which is difficult to be seen in the Heavens; and partly to supply the place of Tables, or Calculations of the *Satellite Eclipses*, which it may do for a little while, tho' it must not be long trusted to.

SATELLITES, by Astronomers, are taken for those Planets who are continually, as it were, waiting upon, or revolving about other Planets; as the *Moon* may be called the *Satellite* of the *Earth*; and the rest of the Planets, *Satellites* of the *Sun*. But the Word is chiefly used for the new Discovered small Planets, which make their Revolution about *Saturn* and *Jupiter*.

SATELLITES of *Jupiter*, are four smaller Moons or Planets moving round about the Body of *Jupiter*, as the *Moon* doth round our *Earth*. They were first discovered by *Gallileus*, by the help of the Telescope.

The Distances of these Satellites, from the Body of Jupiter, are as follows; from the Observations of

	1	2	3	4	
<i>Cassini</i> —————	5.	8.	13.	23.	
<i>Borellus</i> —————	5. $\frac{2}{3}$	8. $\frac{2}{3}$	14.	24. $\frac{2}{3}$	
Mr. <i>Townley</i> by the Micrometer —	5. 51	8. 78	13. 47	24. 72	
Mr. <i>Flamsteed</i> by the Micrometer —	5. 31	8. 85	13. 98	24. 23	
Mr. <i>Flamsteed</i> by Eclipses of <i>Satell.</i>	5. 578	8. 876	14. 159	24. 903	
From the Periodical Times ———	5. 578	8. 878	14. 168	24. 968	Semi-diameters of <i>Jupiter.</i>

The Periodical Times are: Of the

	Days.	Hours.	Min.	
First	1	18	28	$\frac{1}{3}$
Second	3	13	17	$\frac{10}{16}$
Third	7	3	59	$\frac{3}{5}$
Fourth	16	18	5	$\frac{1}{5}$

Vid. Newton's Princip. pag. 403.

Mr. *Flamsteed* in *Philosoph. Transact. N. 154.* says, That when *Jupiter* is in a Quartile of the *Sun*, the Distance of the first *Satellite* from his next Limb when it falls into his Shadow, and is Eclipsed, is one *Semi-diameter*, of *Jupiter*; of the second, two, or a whole *Diameter* nearly; of the third, three; of the fourth, five of his *Semi-diameters*, or something better, when the *Parrallax* of the Orb is greatest. But these Quantities diminish gradually as he approaches the Conjunction or Opposition of the *Sun* somewhat nearly, but not exactly in the Proportion of Sines.

SATELLITES of *Saturn*. Anno. 1684, in the Month of March, Mr. *Cassini*, by the help of excellent Object Glasses, of 70, 90, 100, 136, 155, and of 220 Feet, discovered the two innermost; (that is, the first and second) *Satellites* of *Saturn*.

The First *Satellite* he observed to be never distant from *Saturn's Ring*, above $\frac{2}{3}$ of the apparent length of the same Ring: And it was found to make one Revolution about *Saturn*, in 1 Day, 21 Hours, and 19 Minutes; making two Conjunctions with *Saturn*, in less than two Days; one in the upper part of his Orb, and the other in the lower part: It is distant from the Centre of *Saturn* $4\frac{1}{3}$ of *Saturn's Semi-diameters*.

The Second *Satellite* of *Saturn*, was observed but $\frac{1}{2}$ of the length of his Ring distant therefrom,

making his Revolution about him in two Days, 17 Hours, and 43 Minutes. This is distant from the Centre of *Saturn*, $5\frac{2}{3}$ *Semi-diameters* of that Planet.

From a great number of choice Observations be concluded, That the Proportion of the Digression of the Second to that of the First, counting both from the Centre of *Saturn*, is as 22 to 17.

And the time wherein the Second *Satellite* makes its Revolution, is to the time wherein the first makes its, as $24\frac{1}{4}$ to 17.

The Third is distant from *Saturn*, 8 of his *Semi-diameters*, and revolves round him in almost $4\frac{2}{3}$ Days.

The Fourth, or *Hugenian Satellite*, as 'tis called, because discovered first by Mr. *Hugens*, revolves round *Saturn*, in about 16 Days, and is distant from his Centre about 18 *Semi-diameters* of *Saturn*.

The Fifth *Satellite* of *Saturn*, is distant from his Centre 54 *Semi-diameters* of *Saturn*; and revolves round him in $79\frac{1}{2}$ Days. The greatest distance between this *Satellite*, and the precedent, made Mr. *Hugens* suspect there may be a Sixth between these two; or else that this Fifth may have other *Satellites* moving round him.

Mr. Halley, in *Philosoph. Transact.* N. 145. gives a Correction of the Theory of the Motion of the *Hugenian*, or *Fourth Satellite of Saturn*, and makes the *True Time of its Period* to be 15 Days, 22 Hours, 41 Minutes, 6 Seconds; its *Diurnal Motion*, to be 22 Degrees, 34 Minutes, 38 Seconds, 18 Thirds. And the Distance of this *Satellite* from the Centre of *Saturn*, to be about 4 *Diameters* of the Ring, or 9 of the *Globe*; and the place where it moves, to differ little or nothing from that of the Ring; that is to say, intersecting the Orb of *Saturn* with an Angle $23\frac{1}{2}$ Degrees, so as to be nearly Parallel to the *Earths Equator*.

The Periodical Times of the Satellites of Saturn, according to Mr. Cassini, are of the

	Days.	Hours.	Minutes.
First	1	21	19
Second	2	17	43
Third	4	12	27
Fourth	15	23	15
Fifth	79	22	00

SATURN: The Proportion of the Body of Saturn to our Earth is about 30 to 1.

The Periodical Time of Saturn's Revolution about the Sun, is in the space of 30 Years or 10950 Days.

The Semi-diameter of Saturn's Orbit, is almost ten times as big as that of the *Magnus Orbis*, and therefore is of English Miles 946969690.

According to Mr. Cassini, Saturn's greatest Distance from the Earth is 244330, his mean Distance 210000, and his least Distance 175670 Semi-diameters of the Earth.

Mr. Hugen found the Inclination of the Ring of Saturn to the Ecliptick, to be an Angle of 31 Degrees.

Mr. Azout asserts, That the remote Distance of Saturn from the Sun doth not hinder, but that there is Light enough to see clear there, and more than in our Earth in Cloudy Weather.

In an Observation which Cassini made June 19 1692, of a precise Conjunction between a Fixt Star, and one of Saturn's Satellites, he saith, That with his 39 Foot Glass, he could plainly see the Shadow of Saturn's Globe to be in part oval upon the hinder part of his Ring. The Diameter of Saturn at the time of this Observation, appeared to be 45 Seconds.

The Diameter of Saturn to that of his Ring is as 4 to 9.

And the Diameter of the Ring seen from the Sun, would be but 50". and therefore the Diameter of Saturn seen from thence would be but 11". as Mr. Flamsteed found by measuring it. But Mr. Newton thinks it ought rather to be accounted but as 10". or 9". because he supposes the Globe of Saturn to be a little dilated by the unequal Refrangibility of Light.

Capt. Halley, in his Preface to the Catalogue of the Southern Stars, says, He found Saturn to move slower than the Astronomical Tables represent him.

The Distance of Saturn from the Sun, is about 16 times as great as that of our Earth from him; and therefore that Planet will not have above the 100th part of the Influence of the Sun which we have; and consequently cannot be Habitable by such Creatures as live on our Globe, unless there

be some unknown way of communicating Heat to him.

Dr. Gregory, in his *Astronomy*, makes the Semi-diameter of the Ring of Saturn to that of the Planet, as 2 $\frac{1}{2}$ to 1. and the Interstice between the Planet and the Ring, is the Breadth of the Ring.

How the Ring of Saturn will appear in all parts of the Orbit of the Planet, to an Eye placed at the Sun, or at the Earth, the same Learned Astronomer shews in his *Astron. Phy. & Geometr. Lib. IV. Prop. 69, 70.*

If an Eye were placed in Saturn, the Diameter of the Sun would appear 10 times less than it doth to us almost; and consequently, his Disk, Light and Heat will be there 90 times less. Saturn's Year is almost 30 of ours, but the length of his Day is yet uncertain, because the time of his Revolution round his Axis is not yet known: But Mr. Hugen judges they are not longer than the Days in Jupiter. That great Astronomer supposeth the Axis of Saturn to be perpendicular to the Plane of his Ring, and of the Orbits of the Satellites: If so, then there will be the same Position of the Equator and Poles, (as to the Fixt Stars) as there is in our Earth: The same Pole Star and the Fixt Stars will appear to Rise and Set after the same manner, in the same Latitudes. There is a vast Inequality in the Length of the Day in several parts of this Planet; and as great a diversity of Summer and Winter; which depends on the Quantity of the Inclination of the Plane of the Equator, to the Plane of the Orbit of Saturn round the Sun; which Hugen makes to be 31 Degr. which is almost $\frac{1}{2}$ more than in our Earth; where yet the differences and variety of Seasons and Weather are very sensible. For in Saturn, in the Latitude of 50 Degr. the longest Day will have no Night at all, and the longest Night will have no Day. And the two Frigid Zones will be each of them 62 gr. broad, at least 10 times as large as the whole Surface of our Earth. The Eye thus placed, will be able to discern none of the Planets but Jupiter, which will appear always to accompany the Sun, and never to be from him above 37 gr. The Parallax of the Sun in Saturn, is but 9", and therefore Infensible; but the Parallaxes of all his Moons or Satellites, are very considerable, and therefore their Distances from him will be easily computable.

But what an Eye placed in Saturn would most admire, is the Ring of that Planet; the only thing of that nature that is discovered in any of the Planets. Tho. Kepler in his *Epitome Astron. Copernic. Lib. 4. p. 586*, and after him Capt. Halley in his Enquiry into the Causes of Variation of the Needles Variation, *Phil. Transf. N. 195*, do suppose our Earth may be composed of several Crufts or Shells one within another, and concentric to each other. And if so, then 'tis possible the Ring of Saturn may be the Fragment or remaining Ruins of his formerly exterior Shell, the rest of which is broken and fallen down upon the Body of the Planet. And if Saturn ever had such a Shell round it, its Diameter would then have appeared as big to an Eye at the Sun, as that of Jupiter doth now, when seen from thence.

Since the outward Margin of the Ring is distant from Saturn $2\frac{1}{2}$ of Saturn's Semi-diameter, this cannot be seen at the distance of 64 Degr. from Saturn's Equator (in whose Plane the Ring is placed.) Therefore a Spectator placed in a Latitude higher than that, can never see the Ring at all; so that there

there is a Zone of almost 53° broad towards either Pole, to whom this famous Ring can never appear. And as the Spectator shall move nearer the Pole, first one, then the second Satellite, next the third and fourth; and when he is come within one Degree of the Pole, even the fifth Satellite cannot be seen, unless by Refraction; and in the Winter-time, neither Sun, Moon, nor any Planet, will be there visible, unless perhaps a Comet.

If the Eye be supposed to be placed in the Equator of *Saturn*, or in the Zone nearly adjoining, it can never see those Stars that are in or very near the Equator, nor any one of the Satellites; because the Ring will always hide them; and then at the Equinoxes it cannot see the Sun; and if it were any where else placed, it could not then see the Ring; because neither of its Faces will then appear illuminated by the Sun.

The breadth of this Ring 'tis hard to determine from our Earth, because its Thickness is so small: But Mr. *Hugens* makes it to be about six hundred German Miles.

For one half of *Saturn's* Year, (*viz.* 15 Years of ours) only one Face of the Ring will be enlightened by the Sun: Whence the Inhabitants which may be supposed to live in that Hemisphere, to which this Face of the Ring is turned, or to whom it is Summer, will see that part of the Ring which is above their Horizon, shining faintly by Day, (as our Moon doth when the Sun is above our Horizon) but brighter and stronger by Night, as our Moon doth in the Sun's absence: And after Sun-set, the Eastern part of this enlightened Arch will fall within the Shadow of *Saturn*; which Shade will ascend as Night comes on, and at Midnight will be at the highest; and then will descend again towards the Western part of the Ring, according as the Sun comes more and more to the Eastward.

This enlightened Ark will always shew how to describe a Meridian Line; for a Plane perpendicular to the Horizon, and passing thorough the Vertex of the Ark, will be in the true Meridian.

To an Eye placed any where without, and at less than 52° distance from the Equator, this enlightened Ark of the Ring will appear Concave as well as Convex, like a kind of Furnace or Vault, rising above the Horizon: But to an Eye or more than 52° , and less than 64 Degrees distant from the Equator, the hollow or concave Part will not be visible; but there will appear a bright Body arising as it were out of the Ground, and contiguous to the Horizon.

For the other half of *Saturn's* Year, while the Sun declines towards the depressed Pole; or during the 15 Years Winter, the Ring will not be visible, as having not that Face illuminated which is observed to the Spectator's Eye; but however will render it self sensible, by covering from the Sight, such Stars and Parts of the Heavens as are opposite to it, or apparently behind it. The shade of the Ring also will be extended more and more towards the nearer Pole; so that to an Eye placed any where within the aforesaid space, the Sun, when he attains such a certain Declination, will appear to be covered or eclipsed just at Noon, and then strait to emerge out of the Shadow. The next Day, the like Phenomenon will happen, but the Eclipse will begin sooner, and will be over later: And these Meridian Eclipses will daily increase in their duration, until the middle of Win-

ter; and then they will decrease again gradually, till at last they will come to nothing again; *viz.* When the Sun returning from the Tropic, hath the same Declination as he had when these Meridional Eclipses began.

And this will happen, if any Eye be placed in any Latitude greater than 25 or 26 Degrees; but if in a Latitude less than this, when the Meridian Darknes is of the greatest duration, the Sun will suddenly appear just in the Meridian, and then straitway will be Eclipsed again. The next Day, there will appear the like sort of Light, but it will last longer; and this Meridian Light will grow still longer and longer in duration, till Midwinter, and then (like the Darknes above-mentioned) it will be continually decreasing, until it quite disappear.

And from hence 'tis plain, that there is the greatest difference between Summer and Winter in the Globe of *Saturn*, of all the other Planets; and this both on the account of the long duration of each, and the great declination of the Sun from the Equator; and also, by reason of these Meridional Darkneses in the Winter, arising from the Rings Eclipsing the Sun. *Gregor. Astr. Phy. & Geom. Lib. 6. Prop. 6. p. 480.*

SAUSAGE, is a long piece of Cloth, the sides whereof are sewed in form of a Gut, as large as to contain a Tennis Ball. It is dipt in Pitch or Tar, and filled with Powder, on purpose to serve as a Train to set Fire to Mines, Fougades, or Bomb-Chests. Two of these *Sausages* are commonly applied to every Mine, to the end that if one should fail, the other may take effect.

SAUCISSONS, are a sort of Faggots made of great Boughs of Trees bound together in the middle and at both ends. Their use is much the same with the Bavings or small Faggots, *viz.* to consolidate the Way for Carriages, to make Travellers or Parapets in Ditches full of Water, &c.

SAVER default, in Law, is Word for Word to excuse a *Default* in Court, comes afterwards and alleges a good Cause why he did it, as Imprisonment at the same time, or such like.

SCALADOE, is the mounting of the Wall of a Fortify'd Town or Castle, with Scaling Ladders.

SCALE, in Mathematicks, signifies any Measures or Numbers which are commonly used; or the degrees of any Ark of a Circle, or of such Right Lines as are divided from thence; such as *Sines*, *Tangents*, *Chords*, *Secants*, &c. drawn or plotted down upon a Ruler, for ready Use and Practice in Geometrical or other Mathematical Operations. The several kinds of which follow, as

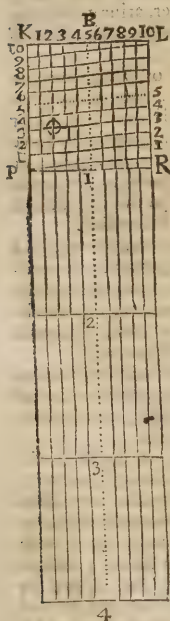
1. *Scales of Equal Parts*; of which that commonly called, a *Plane Scale*, is made by drawing any Right Line, as *a z* on Paper, Pastboard, &c. Then with a Pair of Dividing Compasses run along 10 small Divisions from *a* to *b*; and then setting off the whole Division *a b*, as often as you please, toward the Right-hand, as you see



For then may each of these great Divisions represent 10 Miles, as in a Scale of Miles in a Map; and consequently each of the smaller Divisions one Mile: Or the distance *a b* may be an Inch, and

the lesser Divisions will be both parts of Inches: Or the larger Divisions may be Leagues at Sea, &c. Or, in a word, this Scale may well enough represent any Measures or Numbers whatsoever, whose Parts are equal one to another. But this is more accurately indeed done by a

Diagonal Scale, which the larger Divisions of are commonly of an *Inch*, or of *half an Inch*; and are made upon eleven Lines, so as to include ten equal Spaces (as in the Figure B) which are all cut at right Angles to the Transverse Lines P R. Then P K being divided into 20 equal Parts, as also R L; and from the Points of Division upon the Line P K, to those on the Line R L, are 10 Diagonals drawn; the 1st beginning at P, and ending at the 1st Division above R. The second beginning at the 1st Division above P, and ending at the 2d above R, &c. In short, they are all drawn from one Division less from P, to one Division more from R.

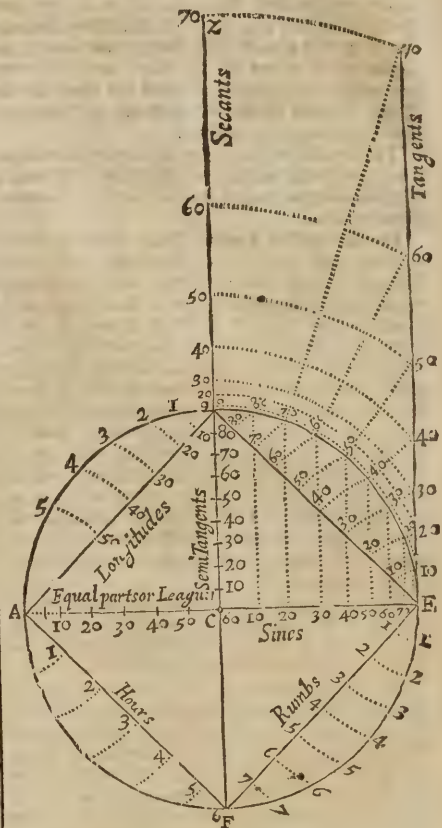


So that every *Diagonal*, by that time it hath passed from the first Line to the eleventh, is a whole 10th part of an Inch farther distant from the Line P R, than at the Point upon the first Line whence it was drawn. And every one of these *Diagonals* is divided into 10 equal Parts by the Parallel-line drawn along the Scale, and numbred on the Top from 1 to 9. Whereby 'tis evident, that the Intersection of any of these Parallel Lines numbred at the Top, with any *Diagonal*, is farther distant from the Line P R than the Intersection of the Line next before it, with the same *Diagonal*, by $\frac{1}{10}$ of $\frac{1}{10}$, that is, by $\frac{1}{100}$. Therefore you may by the *Diagonal Scale*, take the 100 part of an Inch, or of half an Inch, very exactly.

The Use of these Scales, viz. of *Equal Parts*, or the *Diagonal*, is chiefly, To lay down any Measure taken; or a Line being laid down, to find how much of the Measure that Line containeth.

The way to do both which, is to reckon the Unities from P towards R; the Tens, from P towards K; and the Hundreds, from 1, to 2, 3, 4, &c. of the great Divisions. Thus, for 432, count two of the Parallel Lines downward, and then run your Eye forward to the Right-hand, till you come to the 3d *Diagonal*, as at o; then the Compasses on the Line, extended from o to 4, will represent 432.

The Plain SCALE, (for Sea Uses) has also set thereon, the Scale of Chords, Natural Signs, Tangents, Semi-tangents, Seconds, Rhumbs, Hours, Leagues, and Longitudes; with the *Diagonal Scale* on the back-side, and some others, according as there is room. The way of deducing or graduating all which from the equal Divisions, or Degrees of the Circumference of a Circle, is, as in the following Scheme.



Having described the Circle AFE 90°, and quartered it with two Diameters AE, F 90 at Right Angles.

1. Divide the Ark E 90 into 9 equal Parts, and transfer the Divisions to the Right Line E 90, and that will be a Line of Chords.
2. Then Perpendicular to the Radius CE, erect the Tangent E 70; then a Ruler laid over C, and the equal Divisions of the Ark E 90, gives E 70, the Tangent Line truly divided.
3. If thro' the Divisions, 10, 20, 30, &c. on the Ark E 90, then you draw Parallels to C 90, it will divide CE, so as to make it a Line of Sines.

4. Setting one Foot of the Compass in C, extend the other to the several Divisions on the Tangent Line E 70, and describe the Arches 10, 10; 20, 20; 30, 30; &c. and the Line Z 90, will be a true *Line of Secants*.

5. A Ruler from A, to the several Divisions of the Ark E 90, divides the Line C 90, into a *Line of Semi-tangents*.

6. Divide the Ark E F, into eight equal Parts, and setting one Foot in E, transfer the Divisions of the Ark 1, 2, 3, &c. to the Right Line E F, and it shall be the *Line of Rhumbs*.

7. Divide F A, into six equal Parts, and setting one Foot in A, transfer them to the Strait Line FA, and that will be a *Line of Hours*.

8. Divide the Radius AC, into six equal Parts, and thro' each Division draw Lines Parallel to C 90; those Lines will Divide the Quadrant A 90, into six unequal Parts, and those transfer'd into the Chord A 90, makes the *Line of Longitudes*.

9. And the equal Divisions on the Radius A C, being subdivided, is the *Line of Leagues*, or *Line of equal Parts*.

SCALE of the Gamut, or Musical Scale, is a kind of *Diagram*, consisting of certain Lines and Spaces drawn to shew the several Degrees, whereby a Natural or Artificial Voice or sound may either ascend or descend.

The Name thereof is taken from the Greek Letter *Gamma*, which *Guido Aretinus*, who reduced the Greek Scale into this Form, plac'd at the bottom, to signify from whence it was derived; so that ever since, this Scale or *Gamut*, hath been taken for the Ground-work or first Foundation of all Musick, both Vocal and Instrumental.

But there were three different Scales in use among the Ancients, which had their Denominations from the three several sorts of Musick, viz. The *Diatonical*, *Chromatical*, and *Enharmonical*. Which see.

SCALENI, are three Muscles of the Thorax, so called from their Figure, having three unequal Sides.

1. *Scalenus Primus*, which arises fleshy from the Fore-part of the second, third, and fourth Transverse Processes of the *Vertebra* of the Neck; and descending obliquely forwards, becomes Tendinous at its Insertion to the first Rib: The Axillary Nerves pass between this and the following Muscles. Its Use is to draw the Superior Rib, together with the rest, upwards in Inspiration.

2. *Scalenus Secundus*, this springs fleshy from the second, third, fourth, and fifth Transverse Processes of the *Vertebra* of the Neck, laterally, (like the former) in its descent, it becomes thin and tendinous, marching over the first Rib to its Insertion in the second, and sometimes to the third.

3. *Scalenus Tertius*, this has its beginning near the former, from the same Transverse Processes of the *Vertebra* of the Neck; as also from the fifth and sixth of those Processes, and is soon Inserted to the first Rib.

SCALENOUS Triangles. See *Triangles*.

SCALPRUM, a Surgeon's Rasping and Scraping Iron, with which he scrapes rotten Bones.

SCAMILLI Impares, in Architecture, are certain Blocks or *Zocco's* which serve to elevate the rest of the Members of any Column or Statue, which was placed before the Horizon, (i. e.) beneath the Projectures of the *Stylabata Cornices*, and other *Saillies*; and will easily be conceived by considering the Pedestals of Statues, which do well represent them.

SCAMNUM Hippocrati, *Hippocrates's Bench*, is an Instrument of six Ells long: 'Tis used in setting of Bones.

SCANDALUM Magnatum, in Law, is the special Name of a Wrong done to any high Personage of the Land, as Prelates, Dukes, Earls, Barons, and other Nobles; as also of the Chancellor, Treasurer, Clerk of the Privy-Seal, Steward of the House, Justice of the Bench or other, and other great Officers of the Realm, by false News or Messages, whereby Debates and Discords betwixt them and the Commons, or any Scandal to their Persons might arise; and hath given Name to a Writ granted to recover Damage thereupon.

SCAPHA seu Linter, is the Inner Rim of the Ear.

SCAPHOIDES, is the third *Os Tarfi* in the Foot; 'tis joined to the Ankle-Bone, and the three hinder Bones. 'Tis called also *Os Naviculare*, from some resemblance it has to a Boat.

SCAPULA, the Shoulder-blade, a broad triangular Bone, with 3 Processes; 'tis very thin in the middle, but grows thicker about the Processes.

SCAPULARIS, *Externa* and *Interna*, are two little Veins so called, of which the former arises from the Muscles covering the *Scapula*; and the latter, from the Muscles which possess the cavity of the *Scapula*.

SCAPUS, is the term in Botany for the strait Stalk or *Shaft* of a Plant, standing upright like a Pillar or Column.

SCARFED, in the Sea-Carpenters Language, is the same as *Pieced*, or fastened or joined in: Thus they say the Stem of a Ship is *Scarfed* into her Keel; and they employ by it, That the two Pieces are shaped away flanting, so as to join with one another close and even; which they call *Wood and Wood*.

SCARIFICATION; 'tis an Incision of the Skin with a Pen-knife or Lancet. This is done either with or without Cupping-Glasses; without Cupping Glasses, if there be any Mortification or Gangrene, because the separation is by no means to be hastened; with Cupping Glasses, if there be a necessity to take away Blood.

SCARP, in Fortification, is the Foot of the Rampart-Wall, or the sloping of the Wall from the bottom of the Work, to the Cordon on the side of the Moat.



SCARPE, a term in Heraldry, probably derived from the French *Escharpe*, signifying the Scarfe which Military Commanders wear for Ornament. It is born something like a *Batton Sinister*, but is broader than it, and is continued out to the Edges of the Field; whereas the Bottom is cut off at each end.

He beareth Argent a Scarpe Azure.

SCELOTYRBE, is a wandering Pain in the Legs, proceeding chiefly from the Scurvy. Hence the Water proper for this Distemper, is called *Aqua Sceletyrbitis*. *Blanchard*.

SCENOGRAPHY, in *Perspectives*, the *Scenographick* appearance of any Figure, Body, or Building, is that Side that declines from, or makes Angles with that strait Line imagined to pass through the two outward convex Points of the Eyes, generally called by Workmen, the *Return* of a fore-right Side; and differs from the *Orthographick* Appearance in this, That the latter represents the Side of a Body or Building as it is seen, when the Plain of the Glass stands parallel to that Side: But *Scenography* represents it as it seems through a Glass, not parallel to that Side.

In Architecture and Fortification, *Scenography* is the manner of delineating the several parts of a Building or Fortrefs, as they are represented in Perspective.

SCEPTICK, is the term for a Person who maintains there is nothing Certain, and no real Knowledge at all to be had; but that a Man ought to Doubt of, and Disbelieve every thing.

SCHEME, is the Representation of any Geometrical or Astronomical Figure or Problem, by Lines sensibly to the Eye; and these are otherwise called *Diagrams*.

SCETICA febris, is opposed to the *Hectick* Fever, because it is seated mostly in the Blood, and is easily cured; but the *Hectick* Fever is fixed in the very Habit of the Body, and not to be remov'd without great difficulty. *Blanchard*.

SCHIRRUS, and *Schirrroma*, is a hard, livid Swelling, that resists the touch, and is without Pain. *Blanchard*.

SCHOLIUM, is a remark made leisurely, and as it were by the by, on that Proposition, Subject or Discourse before advanced, treated of, or delivered.

SCIATICA, the Gout in or about the Hip-Bone.

SCIENCE, is Knowledge founded upon, or acquired by clear, certain, and self-evident Principles.

SCIOGRAPHY, is the Art of *Shadows* or *Dyal-ing*: Also in Architecture, this Word is sometimes taken for the Draught of a Building cut in its Length or Breadth, to shew the Inside of it; as also the Thickness of the Walls, Vaults, Floors, Timber-works, &c.

SCIOPTICKS. See *Obscura Camera*.

SCIOPTHERICUM *Telecopium*, is an Horizontal Dyal, with a Telescope adapted for observing the true Time both by Day and Night, to regulate and adjust Pendulum Clocks, Watches, and other Time-keepers; Invented by the Ingenious Mr. *Molyneux*, who hath published a Book with this Title, which contains an Accurate Description of this Instrument, and all its Uses and Applications.

SCIRE facias, is a Writ Judicial, most commonly to call a Man to shew cause to the Court whence it Issues, why Execution of a Judgment passed, should not be made out. This Writ is not granted until a Year and a Day be elapsed after a Judgment given. *Scire facias*, upon a Fine, lies not but within the same time after the Fine levied, otherwise it is the same with the Writ of *Habere facias seisinam*.

SCLEROPHTHALMY, it is hard blearedness of the Eyes, accompanied with Pain; a slow motion of the Eyes, with redness and dryness. *Blanchard*.

SCLEROTICA, or hardening Medicines, are such as unite the Parts more firmly amongst themselves; and that either by dissipating the thin and soft Parts, or else sometimes by retaining them; the first by hardening the Matter into a *Schirrus* by too hot Medicines; the latter is done when the Part affected acquires a Hardness, by cooling and astringent Medicines, such are *Sengreen*, *Nightshade*, *Purslane*, and *Water-Lentils*. Therefore these *Sclerotic* Medicines are either Healing, or else Cooling and Astringent. *Blanchard*.

SCLEROTICA Tunica. See *Cornea*.

SCOLIASIS, is a distortion of the Back-Bone to one or t'other side.

SCLOPOMACHÆRION, is a Surgeon's Knife, with which Wounds of the *Thorax* are widened; 'tis used also in opening larger Swellings; as also in opening the *Abdomen*.

SCONCES, are small Forts built for Defence of some Pass, River, or other Place.

Sometimes they are made regular of four, five, or six Bastions; others of smaller Dimensions fit for Passes, or Rivers, and likewise for the Field, which are.

1. *Triangles with half Bastions*, which may be all of equal Sides, or they may be something unequal. However it be, divide the Sides of the Triangle into two equal Parts, one of these three Parts will set off the *Capitals*, and the *Gorges*, and the *Flanks* being at Right-Angles with the Sides, make half of the Gorge.

2. *Square with half Bastions*, whose Sides may be betwixt 100 and 200 Feet; and let one third of the Side set off the *Capital* and the *Gorges*; but the Flank (which raise at Right-Angles to the Side) must be but one half of the Gorge or *Capital*, that is on the sixth part of the side of the Square.

3. *Square with half Bastions and Tong*.

4. *Long Squares*.

5. *Star Redoubt of four Points*.

6. *Star Redoubt of five or six Points*.

7. *Plain Redoubts*, which are either small or great: The small are fit for Court of Guards in the Trenches, and may be a Square of 20 Foot to 30. The middle sorts of *Redoubts* may have their Sides from 30 to 50 Feet; the Great ones from 60 to 80 Feet square.

The Profile (that is, the Thickness and Height of the Brest-works) to be set on these several Works, and the Ditches, are alterable and uncertain; for sometimes they are used in Approaches, and then the Wideness of the Brest-work at the Bottom may be 7 or 8 Foot, Inward Height 6, and Outward 5 Foot; the Ditch may be 8 or 10 Feet, and sometimes 12; and for the Sloaps to be wrought according to the nature of the Earth; sometimes they may be made 14 or 20 Feet Wide at the Bottom, and the Height of 7, 8, or 9 Feet, and

and to have two or three Ascents to rise to the *Parapet*; the Ditch may be 16 or 24 Feet Wide, and 5 or 6 Deep; and sometimes they may come near the smallest sort of Ramparts, and have a Breft-work Cannon Proof, with a Ditch of 50 or 60 Feet Wide, and are thus made to set upon Passes or Rivers to endure.

SCOPER-Holes, in a Ship are Holes made through the Sides, close to the Deck, to carry off the Water that comes from the Pump, or any other way. These Holes in the lowest Deck, and in the *Manniger*, have round Leathers nail'd over them, to keep the Sea-water from coming up into the Ship, which are called *Scoper Leathers*; and the short Nails with broad Heads, which fasten these Leathers down, are called *Scoper-Nails*.

SCORBUTUS, the Scurvy, is a Disease that is Epidemical to the *Hollanders*. The symptoms of it are generally livid Spots on the Hands and Feet, weakness of the Legs, stinking Breath, looseness of the Teeth, bleeding of the Gums, Convulsions, Pains, running Gout, Cholick, &c. *Blanchard*.

SCORE, in Musick, is the Original Draught of the whole Composition, wherein the several Parts, *viz.* Treble, second Treble, Base, &c. are distinctly scored or marked.

SCORPIO, is the 8th Sign of the *Zodiack*, being usually marked thus (m).

SCOT, a Part or Portion, according to *Rastall*, is a certain Custom, or common Tallage made to the Use of the Sheriff, or his Bailiffs; but now signifies a customary Contribution laid upon all Subjects, according to their Ability; for whoever are Affected to any Contribution, are generally said to pay *Scot and Lot*.

SCOTIA, a term in Architecture, the same with *Trochile*; which see.

SCOTIA, is Architecture, in a certain Member hollowed in form of a Demi-channel, which is placed between the *Tours* and the *Astragal* in the Bases of Pillars; as also sometimes under the *Larmier* or *Drip*, in the Cornice of the *Dorick* Order.

SCOTOMY, Dizziness or Swimming of the Head, is when the Animal Spirits are so whirled about, that the external Objects seem to run round. *Blanchard*.

SCORBICULUS Cordis, or *Anticardium*, the *Heart Pit*, formerly called *Gardia*, the Pit of the Breast, or as 'tis usually called the *Stomach*.

SCROPHULA, art preternatural hard Glandules, or preternatural Swellings of the Glandules of the Neck and Ears; they are contained in a proper Tunick. *Blanchard*.

SCROTUM, is that Rag which contains the Testicles of the Male: It consists of a Skin, a fleshy Panniculus, and the two Tunics; of which, the outermost is called *Elyroids* or *Vaginalis*; the innermost Tunic is called *Albuginea*. In the middle of it is a Line extended in the length, which divides the right part from the left, which they call the *Septum*. For its more easie Distention or Contraction, 'tis generally supposed to be void of Fat. See more under the Word *Testes* and *Testiculi*.

SCROTUM Cordis, so some are pleased to call the *Pericardium*; which see.

SCROWLES, or *Volutes*, a term in Architecture. See *Valuta*.

SCURVY. See *Scorbutus*.

SCUTIFORME *Os*. See *Mola Genu*.

SCUTIFORMIS *Cartilago*. See *Ensisformis*.

SCUTTLES in a Ship, are square Holes, big enough to let in the Body of a Man cut in the Deck, to let People down on occasion into any Room below. They are generally before the Main-Mast, before the Knight in the Fore-Castle: In the Gun-Room to go down to the Stern Sheets: In the Round-House to go down into the Captain's Cabin, when forced by the Enemy in a Fight aloft. There are also some smaller Scuttles, which have Gratings over them; and all of them have covers to them, that Men may not tumble in at Night, when 'tis dark.

Also, those little Windows and long Holes which are cut out in Cabbins to let in Light, are called *Scuttles*.

SCUTUM. See *Mola Genu*.

SCYPHOS, is the *Infundibulum* in the Brain; likewise those Passages which convey the Spirit from the *Os Cribriforme* to the *Pallat*, are so called by some Writers. *Blanchard*.

SEA-Gate, when two Ships are aboard one another, by means of a Wave or Billow: The Seamen say, They lie aboard one another in a *Sea-Gate*.

SEA-Quadrant. See *Back-staff*.

SEA-York, when the Sea is so rough, that they cannot govern the Helm with their Hands, then the Seamen seize two Blocks to the end of the Helm; one on each side, and then reeving two small Ropes through them, which they call *Falls*, and which are fastned to the sides of the Ship, by having some Men at each Tackle, they govern the Helm according to Direction. This they call a *Yoke* to steer by. Sometimes they make a *Yoke*, by taking a double turn about the end of the Helm by a single Rope, the ends being laid to the Ship-sides; and by this means they guide the Helm; but this is not so good a *Yoke* as the other.

SEAMS of a Ship, are Places where her Planks meet and joyn together. There is also a kind of peculiar Seam in the fowing of Sails, which they call a *Monks Seam*; which see.

SECANT, is the Right Line drawn from the Centre of a Circle cutting it, and meeting with the Tangent without. See under *Trigonometry*.

SECOND, is the Sixtieth part of a *Minute*.

SECOND Deliverance, is a Writ that lies for him, who after a return of Cattle Replevied; Adjudged to him that distrained them, by reason of a default in the Party that Replevied, for the Replevying of the same Cattle again, upon Security put in for the re-delivery of them in case the Distress be Justified.

SECONDARY Circles, in reference to the *Ecliptick*, or *Circles of Longitude* of the Stars, are such as passing through the Poles of the *Ecliptick*, are at Right Angles to the *Ecliptick* (as the *Meridian* and *Hour Circles* are to the *Equinoctial*). By the help of these (Infinitely many Circles, all Points in the Heavens are referred) to the *Ecliptick*: That is, Any Star, Plane, or other *Phenomenon*, is understood to be in that Point of the *Ecliptick* which is cut by the *Secondary* Semicircle which passes through such Star or Phenomenon. And if two Stars, &c. are thus referred to the same Point of the *Ecliptick*, they are said to be in *Conjunction*; if in opposite Points, they are said to be in *Opposition*: If they are referred to two Points at a *Quadrants* distance, they are said to be in a *Quartile Aspect*;

Aspect; if the Points differ a *sixth part* of the Ecciptrick, the Stars are said to be in a *Sextile Aspect*, &c.

And in general, all Circles which Intersect one of the six greater Circles of the Sphere at Right Angles, may be called *Secondary Circles*; as the Azimuths or Vertical Circles in respect of the Horizon, &c.

SECONDARY Planets, are such as move round others, whom they respect as the Centre of their Motion; tho' they move also along with the Primary Planets in the Annual Orbit round the Sun. And these are otherwise called the *Satellites*: Such is the Moon to the Earth; and *Jupiter* hath four moving round him; as *Saturn*, according to *Cassini*, hath five; *Mars*, *Venus*, and *Mercury*, have no Secondary Planets moving round them, that have been yet discovered.

The Learned Dr. Gregory in his *Astronomia Geom. & Physica*, Lib. IV. shews and proves at large, That tho' the Motion of the Primary Planets be sufficiently simple and uniform, as being compounded only of a projectile Motion forward in a right Line, which is a Tangent to the Orbit, and a Gravitation towards the Sun at the Centre; and also being at such vast distances from each other, that the effects of their mutual Gravitation towards one another are insensible; yet is the matter far otherwise in reference to the Secondary Planets. For every one of these (altho' it chiefly gravitate toward its respective Primary one, as towards its Centre) at equal distances from the Sun, is attracted towards him with equal accelerated Gravity, as the Primary one is towards him; but at a greater distance with *less*, at a nearer distance with *greater*. From which double Tendency towards the Sun, and towards its own Primary Planet, the motion of the *Satellites* or Secondary Planets comes to be mightily compounded and affected with many Inequalities. As for Instance, he Proves,

1. That the Satellite shall be continually accelerated in its Motion from the time of its Quadrature with the Sun, to the next following Conjunction or Opposition, but that contrariwise, from the Syzygys to the Quadratures, it shall be retarded, and therefore will not always move Swifter in or near the Syzygys, and slower near the Quadratures. From whence will follow,

2. That the Orbits of these Secondary Planets will be of a Figure more circular in the Quadratures, than in the Syzygys, where the swiftness of the Motion will make the Figure of the Orbit more Rectilinear. And therefore the Satellite will run farther from its Primary Planet in the Quadratures, than at the Syzygys; so that the Orbit will be a little Elliptical, having the Primary Planet for its Centre; and the longer Diameter will coincide with the Line of the Quadratures, and the shorter with that of the Syzygys.

And these irregularities will arise, if the Sun's power of perturbing the motion of the Satellite be excluded; and the Orbit be concentrick with that of the Primary Planet. For, if the Orbit be eccentric, it may happen that the Satellite shall be farther off from the Primary one in the Syzygys, and so move slower, than it shall do at the Quadratures.

And when this is the case, that the Satellite's Orbit, is not a Circle concentrick to the Primary Orbit, but an Ellipsis in one of whose Focus's the Primary Planet is placed; then the motion of the

Satellite will be so disturbed by the Sun, that as it runs into its Orbit, the *Apes* of the Orbit shall be moved sometimes in *Consequentia*, and sometimes in *Antecedentia* (whereas he proves before, that the *Nodes* and *Apes* of the Primary Planets are at rest.)

3. When the Plane of the Satellite's Orbit, is inclined to the Plane of the Primary Orbit, the Line of the Nodes of the Secondary Orbit will be moved in *Antecedentia*, with an angular motion, and an unequal Velocity; for it will recede most swiftly when the Nodes are in Quadrature to the Sun; after which, it will move slower; and at the time of the Nodes being in the Syzygys, it will be perfectly at rest.

4. The Inclination also of the Plane of the Secondary Orbit to the Primary one, will be continually varying, and will be *greatest* when the Nodes are in the Syzygys with the Sun; and *less* (*ceteris paribus*) when they are in the Quadratures; and from the time of the Nodes being in the Syzygys to the Quadratures, it will be always decreasing; and from the time of their being in the Quadratures to the Syzygys, continually increasing.

And he proves, that all these Irregularities, whether in any excentrick or concentrick Orbit, will always be something greater when the Satellites is in *Conjunction* with the Sun, than when he is in *Opposition* to him.

After this, he proceeds to shew, what Errors or Irregularities in the motion of these Secondary Planets will be produced by the Sun, supposing the Primary Planet to move in an excentrick Orbit round the Sun. Of which, Sect. IV. of the said Book IV.

SECRETION, is the separation of one Fluid from another in the Body of an Animal or Vegetable, by the means of Glands or something analogous to them.

Dr. Havers in his *Osteologia*, explains *Glandular Secretion*, by observing, first, That all Motion in its proper Tendency is direct, (which is exactly, right) and that the Glands which are seated on the sides of the Arteries all over the Body, are so placed, as to favour the motion of any Particles that strike against them in a Right Line, more than the Veins; and having Pores adapted to the Figure of the Particles which they separate, the Particles endeavour in their motion to get into those Glandules; and being there received, are separated and distinguished from the rest of the mass of Blood, and so assume the form of that Liquor which we find separated by every Gland. And that the Glands are so situated as to favour the motion of a Particle in a Right Line more than the Veins, he saith, is apparent from Observation of the gradual construction of the Arterial Channel. See Vol. II.

SECTA ad Curiam, is a Writ that lies against him who refuses to perform Suit either to the County or Court-Baron.

SECTA facienda per illam que habet aniciam partem, is a Writ to compel the Heir that hath the Elder's part of the Co-heirs to perform Service for all the Co-parceners.

SECTA unica tantum facienda pro pluribus hereditatibus, is a Writ that lies for that Heir that is disinherited by the Lord to more Suits than one, in respect of the Land of divers Heirs descended unto him.

SECTIO Casaria. See *Hyſteratomotocia*.

SECTION Conick, is the Figure made by the ſolidity of a Cone's being ſuppoſed to be cut by a Plane.

If the *Section* be made by the *Axis*, or through the *Vertex*, the Figure ariſing is a *Triangle*. If by a Plane, Parallel to the *Base* of the Corner, or *ſubcontrarily* poſited, the Figure produced is a *Circle*.

If the *Section* be made Parallel to one ſide of the Cone, the Figure produced is a *Parabola*: If thro' both ſides of the Cone, 'tis an *Ellipſis*; and if thro' one ſide of the Cone, thro' the *Base*, and not Parallel to the other ſide of the Cone, 'tis an *Hyperbola*.

Archimedes, *Euclid* and other ancient Mathematicians, called that only a *Conick Section*, when the Plane cutting the Cone was at right Angles to the ſide of the Cone; and according as the Angle made by the ſides of the Cone meeting in the *Vertex*, as it was a *right*, *obtufe*, or *acute* one, they called it the *Section of Right-angled*, *Obtuſe-angled*, or *Acute-angled Cone*. By which Words they underſtood what we now call the *Parabola*, the *Hyperbola*, and the *Ellipſis*: Which three Sections, (as alſo the *Circle*) *Apolonius Pergeus* (juſtly called *Magnus Geometra*) found out to be producible in any Cone, according to the four ways of cutting it, as above-mentioned.

SECTION, in Mathematicks, ſignifies the cutting of one Plane by another, or a *Solid* by a Plane.

The common *Section* of two Planes is always a right Line, being the Line ſuppoſed to be drawn on one Plane by the *Section* of the other, or by its Entrance into it.

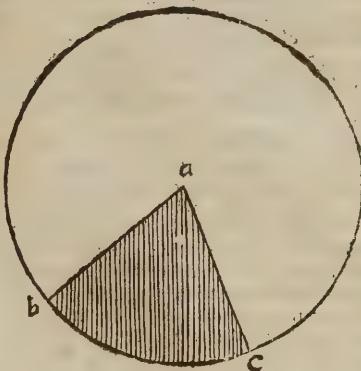
SECTION of a *Building*, in Architecture, is underſtood of the *Perſile* or *Delineation* of its Heights and Depths raiſed on the Plane; as if the *Fabrick* were cut aſunder to diſcover the Inſide.

SECTIS non faciendū, is a *Writ* that lies for a Woman, who, for her *Dower*, ought not to perform *Suit* of Court.

SECTOR, is an *Inſtrument* made of Wood, Ivory, Brals, &c. with a Joint, and ſometimes a piece to turn out to make a true Square, with Lines of Sines, Tangents, Secants, Equal Parts, Rumbs, Polygons, Hours, Latitudes, Metals, Sotids, &c. and is generally uſeful in all the Practical Parts of the Mathematicks, and, particularly contrived for *Navigation*, *Surveying*, *Aſtronomy*, *Dyaling*, *Projection of the Sphere*, &c. By *Gunter*, *Foſter*, *Collins*, and others. There are likewiſe *Sectors* for *Fortification* and *Gunnery*, by Sir *Jonas Moor*.

The great Advantage of the *Sector* above any other Rule or Plain-scale, is that all its Lines can be accommodated to any Radius; which is done by taking off all Diviſions Parallelwiſe, and not Lengthwiſe. The ground of which Practice is this, That *Parallels* to the *Base* of any Plain Triangle, bear the ſame Proportion to it :: as the Parts of the Legs above the Parallel do to the whole Legs.

SECTOR of a *Circle*, is a mixt Triangle comprehended between the Radius and an *Ark* of the Circle.



As here,

The Sector *abc*, made by the Legs *ab* and *ac*, and the Ark *bc*.

To find the ſuperficial Content of any Sector, ſee *Arch*, N. 9.

SECUNDA ſuperoneratione paſture, is a *Writ* that lies where *Admeaſurement of Paſture* hath been made; and he that firſt ſurcharged the Common, doth again ſurcharge it, notwithstanding the *Admeaſurement*.

SECUNDANS, in Mathematicks, is an infinite ſeries of Numbers, beginning from Nothing, proceeding as the ſquates of Numbers in Arithmetical Proportion.

As for Inſtance,

0, 2, 4, 9, 16, 25, 36, 49, 64, &c.

SECONDARY; that Officer who is the ſecond, or next to the chief Officer; as the *Secondaries* of the Fine Office; the *Secondaries* of the Compters, who is next to the Sheriff of London in each of the two Compters; *Secondary* of the Office of the Privy-Seal; *Secondaries* of the Pipe, two; *Secondary* to the Remembrancers, which are two Officers in the Exchequer.

SECUNDINE, the *Secunding* or *After-Birth*, are the three Membranes, *Chorion*, *Alantois*, and *Amnion*, which with the *Placenta*, are excluded after the Birth.

SECURITATE pacis, is a *Writ* that lies for one who is threatned Death or Danger, againſt him that ſo threatneth, and is taken out of the *Chancery*, and directed to the Sheriff.

SECURITATEM inveniendi quod ſe non diſvertat ad partes externas ſine licentia Regis, is a *Writ* that lies for the King againſt any of his Subjects, to ſtay them from going out of his Kingdom: The ground of which is, That every Man is bound to ſerve and defend the Common-wealth, as the King ſhall think meet.

SE defendendo, is a *Plea* for him that is charged with the Death of another, ſaying, he was neceſſitated to do that which he did in his own defence; the other ſo *Aſſaulting* him, That if he had not done as he did, he muſt have been in hazard of his own Life; But this Danger ought to be ſo great, that it ſeems inevitable; and tho' he juſtifie it to be done in his own Defence, yer he is driven

to procure his Pardon of course from the Lord-Chancellor, and forfeits his Goods to the King.

SEDIMENTUM Urinae, the Sediment of Urine, are parts of the nutritious Juice, which being separated from the Blood, with the Serum, because of their Gravity, sink to the bottom of the Urine.

SEEL, a Sea Word much of the same Sense with *Heel*; for as they call it, *heeling*, when a Ship lies down constantly or steadily on one side; so they call it *seeling*, when the rumbles on one side violently and suddenly, by reason of the Sea forsaking her, as they call it; i. e. the Waves leaving of her for a time in a rowling Sea: When a Ship thus rumbles to *Lee-ward*, they call it *Lee-seel*; and in this there is not much danger, even in a Storm, because the Sea will presently right her up again; but if she Rows or Seels to Windward, there is fear of her coming over too short or suddenly, and so by having the Sea break right into her, be either foundered, or else have some of her upper Works carried away.

SEGMENT of a Circle, is a Figure contain'd between a Chord and an Ark of the same Circle.

To find the Superficial Content of any Segment of a Circle, see *Area*, N. 10.

SEGMENT of a Sphere, is a part of it cut off by a Plane; and therefore the Base of such a Segment must always be a Circle, and its Superficies a part of the Surface of the Sphere.

Its solid Content is found by multiplying the Surface of the whole Sphere, by the Altitude of the Segment, and then dividing the Product by the Diameter of the Sphere, and to the Quotient, adding the *Area* of the Base of the Segment.

Or if it is less than an *Hemisphere* thus:

Take the Altitude of the Segment from the Radius of the Sphere, and by the Difference multiply the *Area* of the Base of the Segment; and Subtract this Product from that which will arise from multiplying the Semi-Axis of the Sphere into the Convex surface of the Segment; then divide the Remainder by 3, and the Quotient is the Solidity sought.

This latter Method supposes the Axis of the Sphere to be given; if not, it may be found thus.

Let the Altitude of the Segment be called *a*, and its Semi-diameter *s*.

Then will

$a \cdot s \cdot s \cdot \frac{s}{a}$; add $\frac{s}{a}$ to *a*, and that shall give the Axis sought. 13. b 6. Euclid.

SEGMOIDALES, or *Semilunaries*, are Valves of the *Arteria Pulmonaria*, and are so called, because they resemble a Half-moon, or Segment of a Circle; their substance is Membranous: When they separate, they give passage to the Blood, from the Ventricle into the Artery; but they shut the Passage, and are thrust together by the Blood, if it endeavours to return.

SEGREIANT, the Heralds Word for *Griffins*, when drawn in a leaping or saliant Posture.

SEJANT, (i. e. sitting) the Term is used in Heraldry for a Lion, or other Beast, when it is drawn

in an Escutcheon sitting like a Cat, with his Fore-feet strait.

SEISIN, from the French *Seisine*; *possession*: So *primer Seisin*, is the first possession; and *to Seise*, is to take possession.

Seisin, according to the common Law, is twofold; *Seisin in fact*; and *Seisin in Law*.

Seisin in fact, is when a Corporal Possession is taken.

Seisin in Law, when something is done which the Law accounteth a *Seisin*, as an Inrolment: And this *Seisin in Law*, is as much as a Right to Lands and Tenements, tho' the Owner be by Wrong disseised of them: And he who hath had an Hours Possession quietly taken, hath *Seisin de droit & de claime*, whereof no Man may disseise him by his own force or subtilty, but must be driven to his Action; and 'tis called by Coke, *Seisin in Law*, or *Actual Seisin*.

The *Civilians* call the one *Civilem Possessionem*, the other *Naturalem*.

SESINA habenda, *quia Rex habuit annum, diem & vastum*, is a Writ that lies for Delivery of *Seisin* to the Lord of his Lands or Tenements, after the King, in the Right of his Prerogative, hath had the Years, Day, and Waste.

SEIZING, or *Seasing*, in the Sea Language, is the same as *Fastening*, (viz.) of two Ropes together with some Rope-yarn, &c. Also the fastening of a Block at the end of a Pendant or Tackle, Garnet, &c. is called *Seizing*.

The *Boats seasing*, is a Rope by which a Ring, or little Chain is made fast in the Foreship of the Boat, whereby, in a Harbour, the Boat is fastened to the Ship's side.

SELLA Equina, seu *Turcica*, or *Sphenoides*, a part of the Brain, is compounded of four Processes of the Bone *Sphenoides*, or the Wedge-like Bone; it contains the *Pituitarian Glandule*; and in Brutes, the *Rete Mirabile*.

SEMEIOSIS. See *Diagnosis*.

SEMEIOTICA, is that part of Physick, or the Art of Medicine, which treats of the Signs of Health and Sickness; assisting the Physician to make probable Guesses and Conjectures of the Constitution and State of his Patient.

SEMETs, according to Dr. Grew, are the Apices of the Attire of a Plant. See *Apices*.

SEMI-BREVE, a Term in Musick. See *Notes and Time*.

SEMI-CIRCLE, is the Figure contained between the Diameter of a Circle, and half the Circumference.

Also an Instrument for Surveying, made of Brass, and divided into 180 Degrees, being half the *Theodolite*.

SEMI-COLON, is a Stop, or Point in a Sentence, between a *Comma* and a *Colon*, and mark'd thus (;) and expresses a Pause greater than the former, and less than the latter.

SEMI-CUBICAL Paraboloid, is a Curve whose Ordinates are in *Subtriplicate* of the *Duplicate* proportion of the Diameter: That is, the Cubes of the Ordinates are as the Squares of the Diameters.

In this *Paraboloid*, the Segments of the Curve, cut by Ordinates (at equal Distances) are as the Ordinates in a *Parabola*; and therefore their Squares increased by Equals in Arithmetical Progression; and consequently that Curve to a Right Line, as the Trunk of a *Parabola* to a *Parabola*.

SEMI-

SEMI-CUPIUM, is a Bath, in which the Patient is only up to the Navel in Water.

SEMI-DIAMETER, or *Radius*, is that Line that is drawn from the Center to the Circumference of a Circle.

SEMI-DIAMETER, in Fortification, is twofold, *viz.* the Greater and Lesser: The former being a Line composed of the Capital, and the Small Semi-diameter of the Polygon: And the other, a Line drawn to the Circumference from the Centre thro' the *Gorges*.

SEMI-DIAPASON, a Term in Musick, signifying a Defective or Imperfect *Octave*.

SEMI-DIAPENTE, a Term in Musick, signifying an Imperfect *Fifth*.

SEMI-DITONE, in Musick, is the Lesser Third having its Terms as six to five.

SEMI-LUNARES *Valvulae*. See *Segmoidales*.

SEMI-MEMBRANOSUS, is a Muscle of the Leg, so called from its being half Tendinous and Membrane-like, lying immediately under the *Seminervosus*: It ariseth broad and tendinous from the Protuberance of the *Os Ischium*, and in its descent becomes broader; and in less than half its Progress begins to grow fleshy, and is dilated into a large and fleshy Belly, lying under the long round Tendon of the *Semi-nervosus*, becoming a short thick Tendon, inserted to the superior part of the upper Appendix of the *Tibia* backwards. Its Use is to help to bend the *Tibia*.

SEMINAL Leaves: much the greatest part of all Seeds which are sown in the Earth, come up, or shoot forth at first with too little, plain, soft, and undivided Leaves; which because they are usually very different from the Leaves of the succeeding Plant in Magnitude, Figure, Surface, and Position, are called very properly by this Name *Seminal Leaves*: As the little embrionated Plant which lies in Miniature in every Seed, is called, the *Plantula Seminalis*.

SEMI-NERVOSUS, seu *Semi-tendinosus*, a Muscle of the Thigh, which is so called from its being half Tendinous, and Nerve-like. It ariseth partly Tendinous and partly Fleshy from the External part of the Protuberance of the *Os Ischium*, and presently being dilated to a large fleshy Belly, becomes a round Tendon in half its Progress, which descending over the fleshy Belly of the *Semi-membranosus*, marcheth close by the *Gastrocnemius*, on the posterior part of the Superior Appendix of the *Tibia*; from whence it passes forwards to its Insertion in the said Bone immediately below the termination of the *Gracilis*: This with the *Gracilis* acting, bend the *Tibia* directly backwards. Its Tendon, together with the *Sartorius*, *Gracilis*, *Semi-membranosus* and *Biceps*, make the inward Hamstrings, as they are commonly called.

SEMI-QUADRATE, the same with *Semi-quartile*.

SEMI-QUARTILE, an Aspect of the Planets when distant from each other 45 Degrees, or one Sign and a half.

SEMI-QUAVER, a Term in Musick. See *Notes and Time*.

SEMI-QUINTILE, an Aspect of the Planets, when at the Distance of 36 Degrees, from one another.

SEMI-SEXTILE, an Aspect of the Planets, when distant from one another 30 Degrees, or 1 Sign, and is noted thus, SS.

SEMI-SPINATUS, is a Muscle which seems to be a Continuation of the *Sacer*; and therefore may not improperly be called *Transversalis Dorsi*; it ariseth fleshy from all the Transverse Processes of the *Vertebrae* of the *Thorax*, and marching obliquely upwards, is inserted to the superior Spines of the said *Vertebrae*: These with the *Quadratus Lumborum Sacer*, and *Transversales Colli* acting, move the whole Spine, or *Vertebrae* of the Neck, Back, and Loins, obliquely backwards, as when we endeavour to look very much behind us: If they all act together on each side, they assist in erecting the Trunk of the Body.

SEMI-TENDINOSUS. *Vid. Semi-nervosus*.

SEMI-TONE, a Term in Musick; of which there are two sorts, *viz.* a Greater and a Lesser; the *Enharmonical* *Diesis*, being the Difference between them.

SEMITA Luminosa, is a Name given by Mr. Childrey in his *Britannia Baconica*, p. 183, 184. to a kind of Lucid Track in the Heavens, which a little before the Vernal Equinox, (he saith) may be seen about 6 a Clock at Night, extending from the Western edge of the Horizon up towards the *Pleiades*.

After this, the *Phaenomenon* was taken notice of by *Cassini* and *Fatio*, who both evince, That this Light comes diffused from each side of the Sun: Its brightness is much the same with that of the *Via Lactea*, or the Tail of a Comet. 'Tis seen plainest with us about the beginning of *October*, and towards the end of *February*.

S. *Fatio* conjectures, That the Bodies, or rather the Congeries or Aggregate of those Bodies which occasion the Light, doth conform to the Sun like a *Lens*; and takes it to have ever been the same: But *Cassini* thinks it arises from a vast Number of small Planets which encompass the Sun, and give this Light by Reflection, esteeming it also not to have existed long before he observed it: But this latter is overthrown by *Childrey's* Observations, whose Book was Printed in 1661; and he saith there he had taken notice of it for many Years.

SEND, when a Ship is either at an Anchor, or under Sail, falls with her Head or Stern deep into the Trough of the Sea (*i. e.* into a Hollow made between two Waves or Billows) they say the *sends* much that way, whether it be *A-head*, or *A-stern*.

SENESCALLO & *Marescallo quod non teneant placita de libero tenemento*, &c. is a Writ directed to the Steward, or Marshal of England, inhibiting them to take Cognisance of any Action in their Court that concerns either Freehold, Debt, or Covenant.

SENSATION is the perceiving of things by our Senses; and is the Original of most of the Ideas which we have, which by our Senses are derived to our Understanding.

The *Cartesians* assert Sensation to be only a simple Perception, whereby the Motions of external Objects affecting the Extremities of the Nerves in the Organs of the Body, are communicated all along those Nerves to the *Glandula Pinealis*, where the Soul residing receives her Informations, and accordingly makes Judgments upon them.

In which, (except as to that Whim of the Soul's residing in the *Glandula Pinealis*) they are certainly much in the right: For Sensation is properly and ultimately made in or by the Mind, or discerning Faculty, which probably, from the different Mo-

tions of the internal parts of the Brain, is excited and determined to differing Perceptions; and to these we give differing Names, as Heat, Cold, and other Qualities.

SENSIBLE Horizon. See *Horizon*.

SENSIBLE Point. See *Point Sensible*.

SENSITIVE Plants, are such whose Frame and Constitution is so nice and tender, that at the touch, or at the least pressure of ones Hand, they will contract their Leaves or Flowers, as if they really felt Pain by such a Contract.

Of these the Botanick Writers mention many Kinds, some of which contract with Heat, others with Cold.

SENSORIUM Commune, or the Seat of the common Sense, is that part of the Brain in which the Nerves, from the Organs of all the Senses, are terminated, which is the beginning of the *Medulla Oblongata*.

SENSORY, the Organ or Instrument of Sense, as the Eye of Seeing, the Ear of Hearing, &c.

SENSUS, Sense, is when the Motion impressed by the outward Objects upon the Fibres of the Nerves, is conveyed by the help of the Animal Spirits in the Nerves, to the common *Sensory*, or *Medulla Oblongata*.

SEPARATION, with some Writers of Navigation, is the same with what is more usually called, the *Departure*; that is, a Ship's difference of Longitude from any place, or from another Ship. Our Seamen commonly call it *Easting* or *Westing*; according as the Difference of Longitude is East or West.

SEPHYROS (in some Authors) is a hard Inflammation of the Womb.

SEPTAN Fevers, intermitting Fevers that return every seventh Day.

SEPTANGULAR, the same with *Heptangular*.

SECTENTARIUS, a Constellation in the Northern Hemisphere, consisting of 30 Stars.

SEPTENTRIONAL Signs, are the first 6 Signs of the *Zodiac*, so called, because they decline towards the North from the Equinoctial, and are the same with *Boreal Signs*.

SEPTICA, five Putrefacientia are those things, which by a Malignant sharpness, rot and corrupt the Flesh.

SEPTUM Cordis, the fleshy part that divides the Right Ventricle of the Heart from the left.

SEPTUM Lucidum, is a Partition, which is diaphanous, upon the account of its thinness, it distinguishes the Ventricles of the Brain.

SEPTUM Transversum. See *Diaphragma*.

SEQUATUR sub suo periculo, is a Writ that lies where a Summons ad *Warrantisandum* is awarded, and the Sheriff returns, That he hath nothing whereby he may be summoned; then goes out an *Alias* and *Pluries*; and if he come not at the *Pluries*, then goes out this Writ.

SEQUESTER, is a Term used in the Civil Law for renouncing, as when a Widow comes into Court, and disclaims to have any thing to do, or to intermeddle with her Husband's Estate, who is Deceased; she is said to *Sequester*.

SEQUESTRATION, is the separating of a thing in Controversie from the Possession of both those that contend for it: And it is of two sorts; *Voluntary*, or *Necessary*.

Voluntary, is that which is done by Consent of each Party.

Necessary, is that which the Judge doth of his Authority, whether the Parties will or not.

It is used also for the Act of the Ordinary, disposing of Goods and Chattels of one Deceased, whose Estate no Man will meddle with.

Also for the gathering of the Fruits of a Benefice void to the Use of the next Incumbent.

SEQUESTRO habendo, is a Writ Judicial, for the dissolving a Sequestration of the Fruits of a Benefice made by a Bishop at the King's Command, thereby to compel the Parson to appear to the Suit of another: For the Parson, upon his Appearance, may have this Writ for the Discharge of the Sequestration.

SERIES, properly speaking, is an orderly Progress or Continuation of things one after another. 'Tis commonly in *Algebra* connected with the Word *Infinite*, and there, by *Infinite Series*, is meant certain Progressions, or Ranks of Quantities orderly proceeding, which make continual Approaches to, and if infinitely continued, would become equal to what is inquired after.

This Method took its Rise from the Learned Dr. Wallis's *Arithmetick of Infinites*, and has been of late so pursued by several Worthy Persons of our own Nation, especially the Incomparable Sir Isaac Newton, that it is now one of the greatest Improvements of *Algebra*.

SEROSITIES, are serous Humours abounding in the Body.

SERPENTINE, so the Chymists (from its Figure) call that long winding Worm, which is placed in a Tub of Water in the Distillation of Spirits. See *Worm*.

SERPENTINE Line, the same with *Spiral*; which see.

SERPIGO. See *Lichen*.

SERRATUS Major Anticus, is a Muscle which arises fleshy from the whole *Basis Scapulae*, and passing under the *Subscapularis*, it becomes broader and thicker, still running somewhat forwards till it's inserted to the eight superior Ribs laterally, by so many distinct fleshy Portions, or *Digituli*, representing the Teeth of a Saw; the two, and sometimes three inferior of which, are indented with the *Musculus Obliquus Descendens* of the *Abdomen*. This like the *Serratus Minor Anticus*, dilates the *Thorax*, or moves the *Scapulae* forwards and downwards, when its Muscles are relax'd.

SERRATUS Minor Anticus, is a Muscle, by Anatomists generally reckoned a Muscle amongst those of the *Scapula*: But we are persuaded (says *Cowper*) from its Position that it may be equally serviceable to the *Thorax*, in elevating those Ribs it is inserted to; It arises fleshy from the *Processus Coracoideus Scapulae*, and descends obliquely forwards, becomes broader and thinner, and is inserted fleshy to the bony part of the second, third, fourth, and fifth Ribs. If the *Scapulae* are elevated by their proper Muscles, this with its Partner, are then capable of dilating the Breast in large Inspirations. But if they are depressed, it may be easily conceived with what Difficulty that Action must be performed.

SERRATUS inferior posticus, is a Muscle of the *Thorax*, much larger than Authors generally assign it: "In a Robust Man we observed its Continuation, (says *Cowper*) not only from the Spines of the *Vertebrae* of the Loins, but from all those of the *Thorax*, as well underneath as below the former Muscle; its superior and inferior Parts be-
"ing

ing entirely Tendinous, its Middle growing fleshy near its ferrated Termination at the Curvature of the ninth, tenth, eleventh, and Extremity of the twelfth Ribs. The *Ductus* of the Fibres of this passing transverse, and those of the precedent descending obliquely, do decussate each other in Acute Angles; which *Riolan* has well observed, and contrary to the Opinion of Authors, assigns it with its Partner, a different Use in depressing the *Thorax*; both performing the Office of a Bandage in binding together and constringing the Posterior Muscles of the Spine, not unlike the Constructive Inclosures of the Thigh and Cubit.

SERRATUS superior pecticus, is a Muscle of the *Thorax*; which lies immediately under the *Rhomboides*: It arises with a thin Tendon from two inferior Spines of the *Vertebrae* of the Neck, and three superior of the *Thorax*, from thence descending obliquely over the *Splenius Capitis*, and under parts of the *Sacrolumbalis*, and *Dorsi Longissimus*, it becomes fleshy, marching over the *Scapula*, to its Insertion at the Curvature of the second, third, and fourth Ribs, by so many distinct fleshy endings, representing the Teeth of a Saw, whence its Name. This assists in elevating the Ribs or *Thorax*.

SERVE, to serve a Rope (in the Sea Phrase) is to lay upon it Spun-yarn, Rope-yarn, Sinnet, a piece of Canvas, or the like, which is there rowled fast round about the Rope, to keep it from fretting or galling in any place.

SERVIENTIBUS, are certain Writs touching Servants and their Masters violating the Statutes made against their Abuses.

SERVITUS acquittandis, is a Writ Judicial, that lies for one distrained for Services to *F.* who owes and performs to *R.* for the Acquittal of such Services.

SERUM, is a watery, thin, yellowish, and saltish Humour, which consists chiefly of Water, with a moderate quantity of Salt, and a little Sulphur: The Use of it is to be a Vehicle to the Blood: And this is that watery part that separates from the Blood in the Vessel, after any Person is let Blood. A small Heat will Coagulate it.

SESAMOEIDEA *Osfa*, are 16, 19, 20, and sometimes more little ones, so called from the likeness they have to *Sesamum* Seeds, which are found in the Joints of the Hands and Feet.

SESQUIALTER, in Musick. See *Time*.

SESQUIALTERAL Proportion, is when any Number or Quantity contains another once and an half, and the Number so contain'd in the Greater, is said to be to it in *Subsesquialteral Proportion*.

SESQUIQUADRATE, an Aspect or Position of the Planets, when at the Distance of 4 Signs and an half, or 135 Degrees from each other.

SESQUIQUINTILE, an Aspect of the Planets, when 108 Degrees Distant from each other.

SESQUITERTIAL Proportion, is when any Number or Quantity contains another once and one third.

SESSIONS, is a sitting of Justices in Court upon Commission, as the *Sessions of Oyer and Terminer*, *Quarter-sessions*, otherwise called *General-sessions*, opposite whereto, are *Especial*, otherwise called *Privy-sessions*, which are procured upon some special occasion, for the more speedy dispatch of Justice.

Sessions of Parliament, is a *Sessions* which continues till it be prorogued or dissolved.

SETACEUM, is when the Skin of the Neck is taken up and run through with a Needle; and the Wound afterward kept open by Bristles, a Skean of Silk, &c. which is after moved to and fro, to give vent to the Humours that are ill disposed in that Part. 'Tis also called *Seton* and *Setum*.

SETON, or *Setum*. See *Setaceum*.

SETT, when the Seamen observe on what Point of the Compass, the *Sun*, *Land*, &c. bears, they call it, *Setting* the *Sun*, or *Land*, by their Compass.

SETTLE a Deck, is the Word at Sea for taking a Deck lower than it was at first, which they call *settling* a Deck.

SEVERAL title, is that whereby Land is given or entailed severally, to two Men and their Wives, and to the Heirs of their Bodies begotten; the Donees have joint Estate for their two Lives, and yet they have *several* Inheritance, because the Issue of the one shall have his Moiety, and the Issue of the other, the other Moiety.

SEVERAL Tenancy, is a Plea or Exception taken to a Writ that is laid against two as joint, which are *several*.

SEVERANCE, is the singling or severing of two, or more, that are joined in one Writ.

For Example; If two join in a Writ *de libertate probanda*, and the one afterward be Non-suit: Here *Severance* is permitted; so that notwithstanding the Non-suit of the one, the other may severally proceed.

There is also *Severance* of the Tenants in an Assize, when as one or two, or more Disseisors appear upon the Writ, and not the other.

As also *Severance* in *Attaints*, and *Severance* in *Debt*, where two or more Executors are named Plaintiffs, and the one refuses to prosecute.

Severance of Corn, is the cutting and carrying it off from the Ground; and sometimes the setting out the Tythe from the rest of the Corn, is called *Severance*.

SEW, when a Ship at Low-water comes to lie on the Ground, and to lie dry, they say *she is sewed*; and if she be not quite left dry, they say, *she sews* to such a part.

SEXAGENARY Tables, were Tables contrived (formerly) of Parts proportional, where by Inspection, you may find the Product of two *Sexagenaries* to be multiplied, or the Quotient of two that are to be divided, &c.

SEXAGESIMAL Fractions, or *Sexagenaries*, are such as have always 60 for their Denominator: There were antiently no others used in Astronomical Operations; and they are still retained in many Cases; tho' *Decimal Arithmetick* begins to grow in Use now in Astronomical Calculations.

In these Fractions, (which some call *Astronomical*) the Denominator is usually omitted, and the Numerator only written down: Thus.

$$4^{\circ}, 59', 32'', 50''', 16''''.$$

Is to be read, 4 Degrees, 59 Minutes, 32 Seconds of a Degree, or 60th parts of a Minute, 50 Thirds, 16 Fourths, &c.

The Ancients, before the introducing of Algorithm by the Numeral Figures now in use, (finding

it troublesome to exprefs and manage Fractions of divers Denominators, especially when they are to be expreffed by great Numbers; and troublesome alfo. to exprefs and manage Integers, when they happen to be great Numbers) though fit to divide an Integer into 60 Parts, which they call'd *Sexagesims*, which now we call Minutes, or Scruples; and each of these into 60 Parts, which they called Seconds, and (if there were yet need of greater Exactness) each of these into 60 Thirds; and each of these into as many Fourths; and so onward, as far as there was occasion, which they called *Sexagesims*, or *Sexagesimal parts*.

And (to avoid great Numbers) a Collection of sixty Integers they called a *Sexagene*; and sixty of such, a second *Sexagene*; and sixty of these a third; and so onward, as there was occasion.

Thus, for $\frac{1}{2}$, the fourth part of an Integer, (be it Hour, Day, Degree, or whatever else) they put 15' (that is, 15 Minutes); for $\frac{1}{3}$, they put 7' 30" (that is, 7 Minutes and 30 Seconds); which is exactly the same in Value: And for $\frac{1}{4}$, (because this cannot be exactly exprefs'd in a *Sexagesims*) they would put 8', (which is pretty near, but somewhat too little) or 9' (which is yet nearer, but somewhat too much) or (if these be not exact enough for the present purpose) 8' 34", or 8' 34" 17"; or yet more accurately, if need be, till they come to so much exactness, as that the small remaining difference might safely be neglected.

And such *Sexagesims* were used not only by *Ptolemy*, (by whom the seem to have been first introduced) and other *Greek* Writers, but by the *Arabs* also, (in imitation of *Ptolemy*) and are continued in Use with us to this Day.

So for 227015, (which is the Number of Days, whereby the *Arabic* Years of the *Hegira* begin later than our Account by the Years of our Lord) they put 1''' 3" 3' 35"; that is, 1 Third *Sexagene*, 3 seconds *Sexagene*s, 3 first *Sexagene*s, and 35 Days. And this Account we meet with in the *Alphonfine* Tables, and (of later Times) in those of *Lansbergius*.

And for the better expediting the Work of Multiplication and Division in these *Sexagesims* and *Sexagene*s, they had a Table for that purpose, in such form as this.

$$1 \text{ By } \left\{ \begin{array}{l} 1 \\ 2 \\ 3 \\ 4 \\ \&c. \end{array} \right\} \text{ makes } \left\{ \begin{array}{l} 0 \ 1 \\ 0 \ 2 \\ 0 \ 3 \\ 0 \ 4 \\ \&c. \end{array} \right\}$$

$$5 \text{ by } \left\{ \begin{array}{l} 5 \\ 6 \\ 7 \\ 8 \\ \&c. \end{array} \right\} \text{ makes } \left\{ \begin{array}{l} 0 \ 25 \\ 0 \ 30 \\ 0 \ 35 \\ 0 \ 40 \\ \&c. \end{array} \right\}$$

$$10 \text{ by } \left\{ \begin{array}{l} 10 \\ 11 \\ 12 \\ 13 \\ \&c. \end{array} \right\} \text{ makes } \left\{ \begin{array}{l} 1 \ 40 \\ 1 \ 50 \\ 2 \ 00 \\ 2 \ 10 \\ \&c. \end{array} \right\}$$

$$11 \text{ by } \left\{ \begin{array}{l} 11 \\ 12 \\ 13 \\ 14 \\ \&c. \end{array} \right\} \text{ makes } \left\{ \begin{array}{l} 2 \ 1 \\ 2 \ 12 \\ 2 \ 23 \\ 2 \ 34 \\ \&c. \end{array} \right\}$$

$$30 \text{ by } \left\{ \begin{array}{l} 30 \\ 31 \\ 32 \\ 33 \\ \&c. \end{array} \right\} \text{ makes } \left\{ \begin{array}{l} 15 \ 0 \\ 15 \ 30 \\ 16 \ 00 \\ 16 \ 30 \\ \&c. \end{array} \right\}$$

$$50 \text{ by } \left\{ \begin{array}{l} 50 \\ 51 \\ 52 \\ 53 \\ \&c. \end{array} \right\} \text{ makes } \left\{ \begin{array}{l} 41 \ 40 \\ 42 \ 30 \\ 43 \ 20 \\ 44 \ 10 \\ \&c. \end{array} \right\}$$

And so onward, as far as 60 by 60, makes 60 00.

Which Tables they contracted into a square or triangular Form, extending from 1 to 60; of like nature with what we call the *Pythagorical Table* for Multiplication, extending from 1 to 10.

Such a *Sexagenary Table* there is (or should be, if not torn out) in *Blundevill's Exercises*, with a Description, and Directions for the use of it; first published about the Year 1600, or sooner, (for it is mentioned in the Preface to his Theories, published in the Year 1602, as having been then received with good approbation) and Re-printed a seventh time in the Year 1636. And the like in other Writers of Astronomical or *Sexagesimal* Fractions.

And then they had other Tables or Rules to determine the Denomination of the Product; as thus, Multiplication of

$$\text{Integers into } \left\{ \begin{array}{l} \text{Primes} \\ \text{Seconds} \\ \text{Thirds} \\ \text{Fourths} \\ \&c. \end{array} \right\} \text{ makes } \left\{ \begin{array}{l} \text{Primes} \\ \text{Seconds} \\ \text{Thirds} \\ \text{Fourths} \\ \&c. \end{array} \right\}$$

$$\text{Primes into } \left\{ \begin{array}{l} \text{Primes} \\ \text{Seconds} \\ \text{Thirds} \\ \text{Fourths} \\ \&c. \end{array} \right\} \text{ makes } \left\{ \begin{array}{l} \text{Seconds} \\ \text{Thirds} \\ \text{Fourths} \\ \text{Fifths} \\ \&c. \end{array} \right\}$$

$$\text{Seconds into } \left\{ \begin{array}{l} \text{Seconds} \\ \text{Thirds} \\ \text{Fourths} \\ \text{Fifths} \\ \&c. \end{array} \right\} \text{ makes } \left\{ \begin{array}{l} \text{Fourths} \\ \text{Fifths} \\ \text{Sixths} \\ \text{Sevenths} \\ \&c. \end{array} \right\}$$

The sum of all which Particulars, are equivalent to this one General, the Exponent of the Product, (that is, of the last part thereof) is equal to the Exponent of both the Factors put together, as 10' by 11' makes 1". 50"; and 10' by 12' makes 2" 0", &c. So 10" by 10" makes 1". 40", &c.

My meaning is, That such Tables they had (expressed in Numeral Figures) of later times, since those Figures were in use; but before, they must be expresse in such a way as this, viz.

$$\begin{array}{l} \text{II}^{\circ} \text{ into III}^{\circ}, \text{ makes VI}^{\circ} \\ \text{III}^{\circ} \text{ into IV}^{\circ}, \text{ makes XII}^{\circ}. \\ \text{IV}^{\circ} \text{ into III}^{\circ}, \text{ makes XII}^{\circ}. \end{array}$$

That is, 4 *Sexagene*s into 3 Seconds of the *Sexagesims*, makes 12 of the first *Sexagesims*, because $+1-2=-1$.

XVI" into X'", makes CLX'; that is, II^v, XL^v,

(Which

SEX

(Which they find for Expedition, by consulting their Sexagesimal Table, as we do the Table of Multiplication; where finding XVI in the top, and X in the side, they have, in the square answering to both, II, XL.)

XLV into LIV", makes XL', XXX",

Concerning this Process, by Sexagesimal Multiplication, &c. and the Demonstration of it, we have a learned and accurate Treatise in the Greek, of Barlaam a Monk, (*Barlaamus Monachus*) under the Title of *Logistica*, (*λογιστική*) whom *Vossius* (cap. 18. *De Scientiâ Mathematicâ*) placeth about the Year 1350 (but mistakes of it for a Treatise of Algebra): It is published by *John Chambers*, (then a Fellow of *Eaton College*) with his Latin Translation, and Notes upon it, in the Year 1600, encouraged thereunto by Sir *Henry Savile*, who chanced to light on a Greek Manuscript thereof abroad, and did himself, from thence transcribe it.

But this way of Multiplication and Division in Sexagesimals, proves so perplex and troublesome, (notwithstanding such a Table at hand) that since the *Indian Figures* came in use, whereby we may with more convenience manage great numbers) it is thought less troublesome, (when there is occasion to Multiply or Divide) to reduce all to the lowest Denomination; and then, having performed that Work, (of Multiplication or Division, or both) to reduce it back again to the several Denominations.

As for Instance; supposing the Luner Month of Conjunction, (from New-Moon, to New-Moon) according to the Moon's middle Motion, to be 29 D. 12 H. 44' 3" 10", *Proximè*; and I would compute how much the Moon moves from the Sun in 6 D. 5 H. 14' 16" 35". I know well that there be many Astronomical Tables computed to expedite such Operations; (which here I do not meddle with) but without such Preparatory Tables, my Work must stand thus:

if 29 D. 12 H. 44' 3" 10" (that is, 11' 48 H. 44' 3" 10") give 360 Degrees, (that is 6' 10 D. Sexagenes of Degrees) then 6 D. 5 H. 14' 16" 35" (that is, 2' 29 H. 5' 14" 16" 35") will give, how much?

Now, if I were to Work it by the Sexagesimal Tables of Multiplication, the Work would be so perplex, that I will not here repeat it; and therefore it is thought better to reduce the first and third Numbers to the lowest Denomination, that is (here) to third Scruples.

SEX

D. H. ' " "	D. H. ' " "
29 12 44 3 10	6 5 14 16 35
x 24	x 24
116	144
58	+ 5
12	
	149 14' 163" 5"
708 44' 3" 10"	x 60
x 60	
	8940
42480	+ 14
+ 44	
	8954' 16" 35"
42524' 3" 10"	x 60
x 60	
	537240
2551440	+ 16
+ 3	
	537256' 35"
2551443' 10"	+ 60
x 60	
	32235360
153086580	+ 33
+ 10	
	32235395"
153086590"	

And then the Work will stand thus.

If 153086590 Thirds give 360 Degrees; Then 32235395 Thirds, give how many Degrees?

Where Multiplying the third Number by the second, and dividing by the first, I shall have the Number of Degrees sought in Integers, with the common Fraction annexed; which being reduced to Sexagesimals, will give the answer in Degrees, Minutes, Seconds, &c. Or I might have reduced the 360 Degrees into Thirds also, (which must have been done, if to these Degrees there had been annexed first, second, and third Minutes) and then the Answer had been in third Minutes; and these to be reduced to Degrees, Minutes, &c.

Which Operation, tho' it be troublesome enough, is yet more expedite, than by the Sexagesimal Multiplication and Division, since the time that we have learned, (by help of the Numerical Figure) to manage great Numbers, which in *Prolemy's* time were not in use.

And in like manner, whatever other come to be so Multiplied.

According to this Sexagesimal Method, *Prolemy* divides the Radius or Semi-diameter of a Circle into 60 Parts, (and consequently, the whole Diameter into 120) and each of those Parts into 60 Minutes, and each of those into 60 Seconds, and so forward, as far as occasion requires. And accordingly, the Arch answering to such a Chord; (that is, the sixth part of the Circumference, whose Chord Equals the Radius) into 60 Degr. and consequently the whole Circumference into 360° and each of these Degrees into Minutes, Seconds &c. by a continual Sexagenary Division.

And consonant hereunto, he makes his Table of Chords of Subtenes (in such Parts, Minutes, and Seconds) answering the several Arches in a Circle.

Instead

Instead of which, the *Arabs* or *Saracens* have introduced (as more Expedient) their Table of Sines, (or half Chords of the double Arch) expressed in like manner by sexagesimal Parts.

Which they did in imitation of *Ptolemy*, than that they were necessitated so to do, having the use of Numeral Figures as we have, which *Ptolemy* and others of the Ancients had not.

But *Arzachel* therein differs thus far from *Ptolemy*, that he divides his Diameter into 300 Parts which *Ptolemy* divides but into 120, and hath therefore less need of Subdivisions.

The reason why the Ancients did thus reduce their ordinary Fractions all to one kind of Denomination, was, to avoid the trouble which would arise from the different Denomination of Fractions, which (when they had not the helps that now we have) would be very great; and therefore chose to admit of Approximations, many times, instead of accurate Equalities.

And why they chose the Number 60, rather than any other Number, was, because if they had made use of 12, or such other small Number, they would be put upon a necessity of the more Subdivisions, and a Number much greater than this they could not well manage; (there being, even in this, trouble enough) and of Numbers about this bigness, this was thought most convenient, as being most capable of exact Divisions, without being put to the necessity of Approximations or Subdivisions; admitting, for Divisors, the six first Numbers, 1, 2, 3, 4, 5, 6, (which none less than it can do) and as many more answering to them 10, 12, 15, 20, 30, 60, (that is Twelve in all there being no Number less than it, admitting of so many Divisors; nor can any, greater than it, admit of more, which is not at least twice as great; which cannot be said again of any greater Number, till we come to 360. And this is that which is made the Number of Degrees in the whole Circle.

And this Division of Integers into Sexagesims (Minutes, Seconds, Thirds, &c.) especially in the Parts of Arches, Angles, Time, and Motion; the *Arabs* have retained, in imitation of the *Greeks* (or *Egyptians*) and we from them, even to this Day. *Wallis's Algebra*, Chap. VII.

SEXANGLE, in Geometry, is a Figure consisting of six Angles.

SEXTANS, is the sixth part of any thing, thus: There is an Astronomical Instrument called a *Sextant*, as being the 6th part of a Circle. This hath a graduated Limb, and is used like a Quadrant.

SEXTILE, the Position or Aspect of the Planets, when at 60 Degrees distant, or at the distance of two Signs from one another; and is marked thus, *.

SHACKLES, aboard a Ship, are those oblong Iron Rings, and bigger at one end than at the other, with which the Ports are shut fast, by thrusting the Wooden *Bar* of the Port through them. There are also a sort of Shackles to lift the Hatches up with, of the former Figure, but smaller; they are fastened at the Corners of the Hatches.

SHALLOP, is a small light Vessel with only a small Main-Mast and Fore-Mast, and Lugg-Sails, to hale up and let down on occasion: They commonly are good Sailers; especially the French *Chaboups*; and are used often as Tenders upon a Man of War.

SHAME, is an uneasiness of the Mind, upon the thought of having done something which is Indecent, or will lessen the valued Esteem which others have of us.

SHANK, or *Shank Painter*, in a Ship, is a short Chain fastned under the Fore-Mast Shrouds, by a Bolt to the Ships-side; having at the other end a Rope fastned to it. On this Shank-Painter, the whole Weight of the Aft-part of the Anchor rests, when it lies by the Ship's-side. The Rope by which it is haled up, is made fast about a Timber-head.

SHAPOURNETT: The Heralds call a kind of Cap which is born in some Coats of Arms by this Name.

SHEER, or *Sheering*; the Sea Phrase for the going of a Ship when she is not steered steadily; then they say she *sheers* or goes *sheering*; as they do also when she goes in and out by means of the swift running of a Tide-Gate, &c. for then being at an Anchor, they say there is danger, lest she should *sheer home* her Anchor, or *sheer a-shore*.

SHEER-Hooks, aboard a Ship; are great Hooks of Iron sometimes used when a Ship designs to board another. They are like a Sickle, and are let into the Main-Yard-Arms and Fore-Yard-Arms in order to spoil, cut or tear the Enemy's Shrouds, Sails, or Rigging.

SHEER-Shanks, at Sea, is the term for a kind of Knot, by which they tie up or shorten a Runner when 'tis too long, so that they cannot hoise in the Goods by it over the Ship's-sides. This Knot can be let loose again when they please.

SHEERS, for the Seamen call two Masts Yards, or Poles set up and seized a-cross each other aloft, near the top. This Pair of *Sheers*, as they call it, is placed below on the *Chain-Wales* of the shrouds, and lashed fast to the Ship's-sides to keep them steady aloft. Their use is to set in or take out a Mast; for which end, there is fastned at the place where they cross one another, a strong double Block with a strap. They serve also to hoise in or out of Boats that have Masts, such Goods as are wanted to be taken in or out.

SHEATHING of a Ship, is casing that Part of her which is to be under Water, with something to keep the Worms from eating into her Planks. 'Tis usually done by laying Tar and Hair mixt together all over the old Plank, and then nailing on thin new Boards: But this hinders a Ship's Sailing; and therefore of late some have been sheathed with milled Lead.

'Tis very well worth trying what the New-stone Pitch will do in this case; if it will defend from the Worm, as perhaps it will, a Ship might be Paid with it cheaper than with the Crown-Pitch; and it will not crack nor scale off as that will do, but keep always soft and smooth. I have seen where it hath been on 13 Months, and yet it was very black and soft.

SHEATS in a Ship, are Ropes bent to the Clews of the Sails; serving in the Lower-fails to *Hale-aft* or *Round-off* the Clew of the Sail: But in Top-fails they serve to *Hale-home* as the Word is, or to hale the Clew of the Sail close to the Yard-Arm.

If the Main-fail Sheats are *haled-aft*, 'tis in order to make the Ship keep by a Wind; but when the Fore-sheats are *haled-aft*, 'tis that the Ship may fall off from the Wind: And if she will not do it readily, they then hale the Fore-fail (by the sheat) flat in, as near the Ship's-sides as they can; and this they call *Flattning in the Fore-fail*. When they say, *Ease the Sheat*, they mean *Peel it*, or let it go out gently; but when the Word is, *Let fly* the

the *Sheat*, they mean, let it go all at once, and run out as fast as it can; and then the Sail will hang loose, and hold no Wind. In a very great Gale or Gust of Wind, there is another Rope bent to the Clews of the *Main-sail* and *Fore-sail*, above the *sheat* Block, to succour and ease the *Sheat*, and then they call a *False-sheat*.

Sheats in a Ship, also, are those Planks under Water which come along her *Run*, and are closed into the *stern Post*: So also that Part within Board in the *Run* of the Ship, is called the *Stern-sheats*. The Seamen say when they would have the *sheats* of the Main or Fore-sail haled aft, *Tally the sheats*.

SHEWING, in Law, is to be quit of Attachments in any Court, and before whomsoever in Plaints shewed, and not avow'd.

SHIFTERS, certain Men aboard a Man of War, who are employed by the Cooks to shift or change the Water in which the Flesh or Fish is put and laid for some time, in order to fit it for the Kettle.

SHIVERS, so the Seamen call those little round Wheels in which the Rope of a Pulley or Block runs. They turn with the Rope, and have pieces of Brass in their Centres, (which they call the *Cocks*) with Holes in them, into which the Pin of the Block goes, and on which they turn. These *Shivers* are usually of Wood; but some are of Brass, as those in the *Heels* of the *Top-masts*.

SHOALE, in the Sea phrase, is the same as shallow: They say, 'tis good *Shoaling*, when as a Ship sails towards the shoar, she finds by her sounding, it grows shallow by degrees, and not too suddenly; for then a Ship may go in safety.

SHORT-Accent, in Grammar, shews that the time of Pronunciation ought to be short, and is marked thus (').

SHOT of a Cable, is the splicing of two Cables together, that a Ship may ride safe in deep Waters, and in great Roads: For a Ship, will Ride easier by one shot of a Cable, than by three short Cables out a-head.

SHOT, for Ordnance, are of several sorts, as *Round-shot*, which are round-Bullets fitted in proportion to the Bore of the Piece.

Cross-bar-shot, are round shot, with a long spike of Iron cast in it, as if it did go through the middle of it.

Trundle-shot, being only a Bolt of Iron 16 or 18 Inches long, sharp-pointed at both ends, and about a Hand's breadth from each end, having a round broad Bowl of Lead cast upon it, according to the Bore of the Piece.

Langrel-shot, which runs loose with a shackle to be shorned when it is put into the Piece; and when it flies out, it spreads it self. At each end of the Bar it has half a Bullet, either of Lead or Iron.

Chain-shot, is two Bullets with a Chain betwixt them, some being contrived round, yet so that they will spread in flying their full Length and Breadth.

Case-shot, is any thing of small Bullets, Nails, old Iron, and the like, to put into the *Case*, to shoot out of Ordnance.

SHOULDRING, in Fortification, is a Reinforcement opposed to the Enemies, or a Work cast up for a Defence on one side, whether it be made of heaps of Earth cast up, or of *Gabions* and *Facines*. A *Shouldring* also is a square *Orillon* sometimes made in the Bastions on the Flank near the shoulder, to

cover the Canon of a Casemate. Again, it is taken for a Demi-bastion or Work consisting of one Face, and one Flank, which ends in a Point at the head of a *Horn-work* or *Crown-work*: Neither is it to be understood only of a small Flank added to the sides of the *Horn-work*, to defend them when they are too long, but also of the Redents which are raised on a strait Line.

SHROWDS, are great Ropes in a Ship, which come from either side of all Masts. They are fastened below by Chains to the Ship's sides, and aloft over the Head of the Mast; their *Pendants*, *Fore-tackle*, and *Swifters* being first put under them: They are also served there, to prevent their galling the Mast. The *Top-mast-throwds* are fastned to the *Putrocks* by Plaits of Iron; and by Dead-mens Eyes and Lanniers also as the others are. The terms are *Ease the shrowds*; that is, slacken them: *Set Taught the Shrowds*; that is, set them stiffer. The Bolt-sprit hath no throwds.

SICUT *alias*, is a second Writ lent out, when the first was not executed.

SIDEMEN, or *Questmen*, be those that are Yearly Chosen, according to the Custom of every Parish, to Assist the Churchwardens in the Enquiry and representing such Offenders to the Ordinary, as are Punishable in the *Court Christian*.

SIDERAL Year. See *Solar Year*.

SIDERATIO. See *Spacelos*.

SIEF, *Album*. See *Collyrium*.

SIEGE, is the encamping or sitting down of an Army before a Place, in order to take it, either by Force or by Famine.

SIGMOIDE, are the *Apophyses* of the Bones, representing the Letter C of the ancient Greeks. Also the *Valves* of the great Artery that hinder the Blood from returning back to the Heart.

SIGNIFICABIT, is a Writ *de Excommunicato capiendo*, which issueth out of the Chancery upon a Certificate given by the Ordinary, of a Man that stands obstinately Excommunicate, by the space of forty Days, for the laying him up in Prison without Bail or Mainprize, until he submit himself to the Authority of the Church. And 'tis so called, because the Word *Significavit* is an Emphatical Word in the Writ. There is also another Writ in the *Register*, *Fol. 7.* directed to the Justices of the Bench, commanding them to stay any Suit depending between such and such, by reason of an Excommunication alledged against the Plaintiff; because the sentence of the Ordinary that did Excommunicate him, is appealed from, and the Appeal yet depends undecided.

SILICUA, in Botany, is the Seed-vessel, *Husk*, *Cold*, or *Pod*, of such Plants as are of the Leguminous kind.

SILLON, in Fortification, is an elevation of Earth, made in the middle of a Moat, to Fortifie it when too broad: It is otherwise called *Envelope*, which is the more common Name.

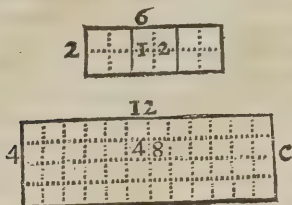
SIMILAR *Arks* of a Circle, are such as are like Parts of their whole Circumference.

SIMILAR *Bodies*, in Natural Philosophy, are called such as have their Particles of the same Kind and Nature one with another.

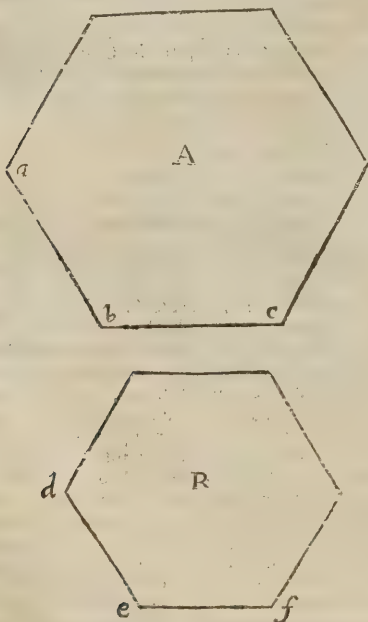
SIMILAR, or *simple Parts*, by Anatomists are called such as are throughout of the same nature and texture, as all the Parts of the Bone are Bony, &c.

SIMILAR *Plane Numbers*, are those *Numbers* which may be ranged into the form of *similar Rectangles*;

angles; that is, into Rectangles, whose sides are Proportional, such are 12 and 48; for the sides of 12 are 6 and 2 (as in Fig. B.) and the sides of 48 are 12 and 4 (as in Fig. C.) But $6.2::12.4$, and therefore those Numbers are *similar*.

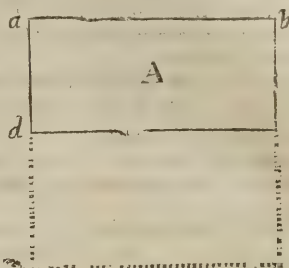


SIMILAR Polygons, are such as have their Angles severally Equal, and the sides about those Angles Proportional.



Thus, if in the Polygon A, all the Angles abc , &c. are respectively equal to all those def , &c. in the Polygon B. And that also ab hath the same Proportion to $bc::ad$ hath to ef . Then those two Polygons are *similar*.

SIMILAR Rectangles, are those which have their sides about the equal Angles Proportional; that is, as $ab:eb::ad:ef$.



COROLLARY I.

All Squares must be *similar Rectangles*; for (since they have all their Sides equal, and all their Angles right) whatever Proportion the side am hath to the side bi of the other Rectangle, the same must also the other side ab have to the side eb ; because they are equal to am , and to bi .

COROLLARY II.

Hence all *similar Rectangles* are to each other as the *squares* of their *Homologous sides*.

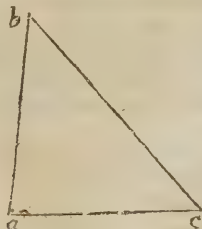
For the Rectangle A, is to B :: as the Square bm is to the Square ei ; since as well Squares as Rectangles are in a duplicate Ratio to that of their sides.

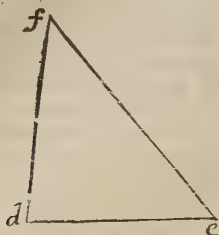
SIMILAR Right-Lin'd Figures, are such as have equal Angles, and the sides about those equal Angles proportional.

SIMILAR Segments of a Circle are such as contain equal Angles.

SIMILAR solid Numbers, are those, whose little Cubes may be so ranged as to make *similar* and rectangular Parallelopipeds.

SIMILAR Triangles, are such as have all their three Angles respectively equal to one another.





As if the Angle a be equal to d , the Angle c equal to e , and the Angle b equal to f ; then is the Triangle abc similar or like to dfe : And then the sides about the Equal Angles are always proportional; that is, ab hath the same Proportion to ac as fd hath to de , and is thus written;

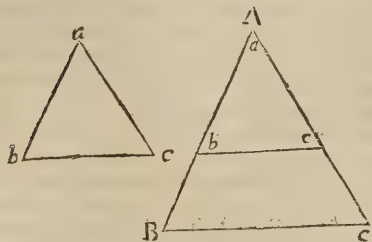
$$ab : ac :: fd : de.$$

PROPOSITION.

All Similar Triangles, have the sides about their Equal Angles Proportional.

Thus in the Figure.

I say, $AB : ab :: AC : ac :: CB : bc$, &c.



For set the lesser Triangle into the greater, by taking $Ab = ab$, and $Ac = ac$, then will the Base bc , be the same as in the lesser Triangle; and the whole Triangle Abc , will be equal to abc .

And therefore the Angle Abc , will be equal to the Angle B , and $Ac = C$.

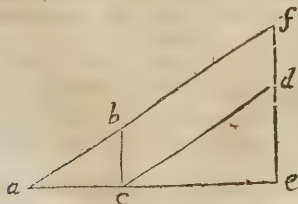
Wherefore the Line bc , is Parallel to Bb : And therefore,

$$Ab : AB : Ac : AC :: bc : BC, \text{ \&c.}$$

Q. E. D.

Otherwise thus, according to *Euclid*.

Let the Triangle abc , be similar to dce . Then I say, That the sides about their Equal Angles are Proportional:



Set the Bases of the two Triangles ac and ec , together as that they may join and make one

Right Line ae ; and draw out the Lines ab and ed , till they meet together in the Point f .

DEMONSTRATION.

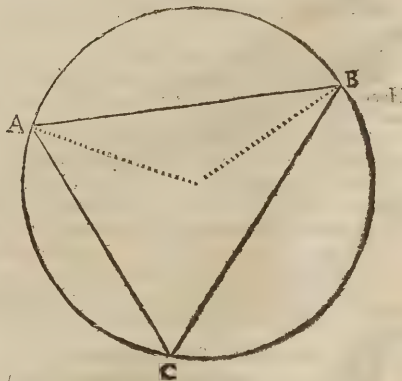
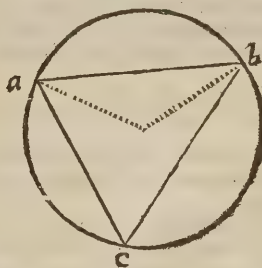
Because the Angle $a =$ Angle dce , af , is Parallel to cd also, because the Angle acb , is equal to the Angle ecf ; the Lines bc and fe are Parallel. Wherefore $bcdfe$, must be a Parallelogram, whose opposite sides are equal, that $bf = cd$, and $bc = fd$.

Therefore because cd is Parallel to the Base af , of the Triangle fea ; $de : fd$ (or bc) :: $ec : ac$.

That is, $de : bc :: ec : ac$. And therefore alternately, $de : ec :: bc : ad$. And so the sides about c and e are proved Proportionable.

Also because bc is Parallel to the Base fe , of the Triangle afe . Therefore $ec : ac :: fb$, (or cd) : ab : That is, $ec : ac :: cd : ab$. And therefore alternately, $ec : cd :: ac : ab$. And so the sides about the equal Angles a , and dce , are found Proportional. The same may be easily done by the Angles b and d .

Another Demonstration by *Pardie*.



Because the Angle A is $=$ to a , Angle C to c , &c. Therefore the Ark opposite to them must be equal: (That is, not in length, but must contain an equal Number of Degrees.) Wherefore Chords also subtending those Arks, must be Proportionable Chords of the same Number of Degrees; and consequently will be all Similar Parts of their own proper Radius.

That is, $ca : ab ::$ (in respect of its Radius) $CA : AB$. in respect of its Radius. Therefore

the Sides about the equal Angles will be proportional.

Or, $bc : ba :: BC : BA$, Q. E. D.

COROLLARY I.

From hence it follows, That all *Similar Triangles* are to one another, as the Squares of their Homologous Sides. For these *Triangles* are the Halves of *Similar Triangles* or *Parallelograms*, which are to one another in a *Duplicate Ratio* of their Homologous Sides; Therefore the Halves must be as the Wholes.

COROLLARY II.

All *Similar Polygons* are to one another as the Squares of their Homologous Sides. For being made up of *Similar Triangles*; the Aggregates or Sums will be to each other, as the Parts cut, of which they were made.

SIMONY, is an unlawful Contract made to have a Man presented to a Rectory or Vicarage: It was agreed by all the Justices, that if the Patron present any Person to a Benefice with Cure, for Money, that such Presentation, &c. is void, tho' the Presentee were not Privy to it, and the Statute gives Presentation to the King: But this is now repealed.

SIMPLE Flank. See *Flank*.

SIMPLE Place, a Term in Geometry. See *Place Simple*.

SIMPLE Problem. See *Linear Problem*.

SIMPLE Problem, in Mathematicks. See a *Linear One*.

SIMPLE Quantities, in Algebra, are such as have but one Sign, whether Positive or Negative: Thus.

$2a$, and $-3b$, are *Simple Quantities*.

But $a + b$, and $+d - c + b$ are compound ones.

SIMPLE Tenaille. See *Tenaille*.

SINAPISMUS, is a Medicine applied to the Head, and is prepared of Mustard, Wild Raddish, and Leven. *Blanchard*.

SINCIPUT, the Fore-part of the Head, reaching from the Fore-head to the Coronal Suture.

SINE, or *Right Sine*, is a right Line drawn from one end of an Arch, perpendicularly upon the Diameter drawn from the other end of that Arch; or it is half the Chord of twice the Arch. See more under the Word *Trigonometry*.

SINE assensu capitali, is a Writ against him that alienates Lands without consent of his Chapter or Covent.

SINE Complement. See *Complement*.

SINE die, in Law, when Judgment is given against the Plaintiff, he is said to be *in misericordia pro falso clamore suo*: But when for the Defendant, then 'tis said, *Eat inde sine die*.

SINGLE, or *Simple Excentricity*. See *Eccentricity*.

SINGULTUS, or the Hickoup, is a Convulsive Motion of the Midriff, caused by rough and irregular Particles, forcing it to this disordinate Motion. *Blanchard*.

SINICAL Quadrant, is made of Brass or Wood, with Sines drawn from each Side intersecting one another, with an Index divided by Sines also,

with ninety Degrees on the Limb, and two Sights to the Edge, to take the Altitude of the Sun. Sometimes instead of Sines, 'tis divided all into equal Parts: And is used by Seamen to solve by inspection any Problem of *Plain Sailing*.

SINESTER Side or Part of an Efcutcheon, is the left Side Part. *Vide Efcutcheon*.

SINNET, is a Line or String made of Rope-yarn, consisting generally of two, fix, or nine Strings, which are divided into three Parts, and are platted over one another, and then it is beaten smooth and flat, with a Wooden Mallet, its use is to *Serve* the Ropes, that is to keep them from gawling.

SI non omnes, is a Writ of Association, whereby, if all in Commission cannot meet at the Day assigned, it is allowed, That two, or more of them, may finish the Business.

SINUS, any Cavity in or between the Vessels of an *Animal Body*, the Anatomists call a *Sinus*, and some Philosophical Writers call these Fissures or Cavities which are between the several Strata or Layers of the Earth, in Mines, &c. by this Term *Sinus*, for *Sinus* in Mathematicks. See *Sine*.

SINUS Meningium, are those 3 Cavities which *Galen* calls the Ventricles of the Thick Membrane. The first and second, or the Lateral *Sinus*, are seated between the Brain and the *Cerebellum*, and end in the vertebral *Sinus's*. The third begins from the *Os Cribriforme*, and ends in the middle of the former *Sinus's*. The fourth arises from the *Pinealis* Glandule, and ends in the middle of the lateral *Sinus's*. The Inferion of these *Sinus's* is called *Trocular Herophili*. The *Sinus's*, after they have passed through the Scull, are partly continued with the Jugular Veins, and partly descend through the whole length of the Spinal Marrow down to the *Os Sacrum*. The use of them is to supply the place of Veins, for they convey the Blood from the Brain and *Cerebellum*, partly into the Jugular Veins, and partly into the Vertebral *Sinus's*. *Blanchard*. With us the Ventricles of the Brain are accounted only the three Partitions or Subdivisions of the Forinx; and they serve as a Sink to drain away the excrementitious Matter of the Brain.

SINUS Ossium, are those Cavities of the Bones which receive the Heads of other Bones.

SIPHON, a Glass or metalline crooked Pipe, Tube, or Cane. See *Syphon*.

SI Recognoscant, is a Writ that lies for a Creditor against his Debtor, for Money numbered, that hath before the Sheriff in the *County Court*, acknowledged himself to owe his Creditor such a Sum, received of him in *pecuniis numeratis*.

SIRIUS, the *Dog-star*, a bright Star of the first Magnitude, in the Constellation *Canis major*, its Longitude is 99 Degrees, 47 Minutes, Latitude 39 Degrees, 32 Minutes.

SIRONES, little Pusles in the Palm of the Hand, and Sole of the Foot, containing certain small Insects or Worms.

SCARFED, the Sea Term, when one Piece of Timber is let and fasten'd into another. See *Scarfed*.

SKELETON, of a Man or other Animal, is when the Bones are cleaned and dry, and put together according to Art in their natural Order and Position.

SKUPPERS, and *Skupper-holes*. See *Scoper-holes*.

SLATCH, when any Rope or Cable hangs slack, the Seamen call the middle Part which hangs

hangs down, the *Slatch* of the Cable or Rope, so also after long foul Weather, if there come a small Intervall of fair, they say, this is a *Slatch* of fair Weather.

SLEEPERS, Timbers lying before and aft in the bottom of a Ship as the Rung-heads do; the lowermost of them is bolted to the Rung-heads, and the uppermost to the *Futtocks*, in order to strengthen and fasten the *Futtocks* and *Rungs*.

SLIDING Rules, or Scales, are Instruments to be used without Compasses, in Gauging, Measuring, &c. having their Lines fitted so as to answer Proportions by Inspection; they are very Ingeniously contrived and applied by *Gunter*, *Partridge*, *Cogshall*, *Everard*, *Hunt*, and others, who have Written particular Treatises about their Use and Application.

SLING, a Word used variously at Sea; there are *Slings* to hoist up Casks or any other heavy things; which are made of Ropes, spliced into themselves at either end, with an Eye big enough to hold the thing to be *Slung*.

There are other *Slings* which are made longer and with a small Eye at each end, one of which is put over the Breech of a Piece of Ordnance, and the other Eye comes over the end of an Iron Crow, which is put into the Mouth of the Piece, to Weigh and Hoist the Gun as they please.

There are also *Slings* for the Yards, which is done by binding them fast to the *Cross-tree* aloft, and to the Head of the Mast with a strong Rope or Chain, that if the Tye should happen to break, or to be shot to pieces in a Fight, the Yard nevertheless may not fall down upon the Hatches.

SMELLING, is probably occasioned by the *Effluvia* of Odorous Bodies mingling themselves with the Air, and entering up the Nostrils, which are covered with a very Nervous and Sensible Coat, and there insinuating themselves into the Processes of the Olfactory Nerve, do move it variously according to their various and different Nature, and so communicate to the Brain, such corresponding Motions, as enables the Soul to judge differently of the Bodies emitting such *Effluvia*: And from hence when the *Effluvia* produces a grateful Sensation, we say its hath a sweet Smell, but when a disagreeable one, we say it stinks.

SMITEING-Line, in a Ship, is a small Rope fastened to the Mizen-yard Arm, below at the Deck, and is always furled up with the Mizen-sail, even to the upper end of the Yard, and from thence it comes down to the Poop. Its Use is to loose the Mizen-sail without striking down the Yard, which is easily done, because the Mizen-sail is furled up only with Rope-yarns; and therefore when this Rope is pulled hard, it breaks all the Rope-yarns, and so the Sail falls down of it self: The Word of Art is, *Smite the Mizen* (whence this Rope takes its Name;) that is, hale by this Rope that the Sail may fall down.

SNATCH Block, is a great Block in a Ship, with a Shiver in it, having a Notch cut thro' one of its Checks for the more ready receiving in of any Rope: For by this Notch, the middle part of a Rope may be reeved into this Block, without passing it in end-ways. This ready Block is commonly fastened with a Strap about the Main-mast, close to the Upper Deck, and is chiefly used for the Fall of the *Winding Tackle*, which is reeved into this Block, and then brought to the Captain.

SNOW. The Learned Dr. Grew, in *Philoso-*

phical Transactions, N. 92. gives the following Account of Snow, which seems very exact and just.

1. With Mr. *Des Cartes*, and Dr. *Hook*, he observes, That many parts hereof are of a Regular Figure; for the most part being as it were so many little Rowels, or Stars of 6 Points; being perfect and transparent Ice, as any one may see upon a Pool, or Vessel of Water; upon each of which 6 Points, are set other collateral Points, and those always at the same Angles, as are the main Points themselves.

2. Amongst these Regular Figures, tho' many of them are large and fair; yet from these taking our first *Item*, many others, alike Regular, but far less, may likewise be discovered.

3. Amongst these, not only Regular, but entire Parts of Snow, looking still more warily, we shall perceive, that there are divers others indeed irregular, which yet are chiefly the broken Points, Parcels, and Fragments of the Regular ones.

4. That besides the broken parts, there are some others which seem to have lost their Regularity, not so much in being broken, as by various Winds, first gently Thaw'd, and then Froze into little irregular Clumpers again.

From whence the true Notion, and external Nature of Snow, seemeth to appear, viz. That not only some few parts of Snow, but originally, the whole Body of it, or of a Snowy Cloud, is an infinite Mass of Icicles regularly figured; not one Particle thereof I say, originally, not one of so many Millions, being indetermined, or irregular; that is to say, a Cloud of Vapours being gathered into Drops, the said Drops forthwith descend; upon which Descent, meeting with a soft freezing Wind, or at least passing thro' a Colder Region of the Air, each drop is immediately froze into an Icicle, shooting it self forth into several Points or *Stiries*, on each Hand forward its Centre: But still continuing their descent, and meeting with some sprinkling and intermixing Gales of Warmer Air, or in their continual Motion and Waftage to and fro, touching upon each other; some are a little thaw'd, blunted, frosted, clump'd, others broken, but the most hanked and clung in several Parcels together, which we call Flanks of Snow.

It being known what Snow is, we understand; why, though it seem to be soft, yet 'tis truly hard: because true Ice, the inseparable property whereof is to be hard; seeming only to be soft, because upon the first touch of the Finger, upon any of its sharp Edges or Points, they instantly thaw; or otherwise they would pierce our Fingers as so many Lancets.

Why again, though Snow be true Ice, and so hard and dense a Body, yet very light; because of the extreme thinness of each Icicle in comparison of its breadth. For so Gold, which though of all Bodies it be the most ponderous, yet being beaten into Leaves, rides upon the least breath of Air; and so in all other Bodies, where there is but little Matter contained within large Dimensions, and possibly in no other Case.

Also, how it is *White*, not because hard; for there are many soft Bodies White; but because consisting of parts, all of them singly transparent, but being mixed together appear White; as the Parts of Froth, Glais, Ice, and other transparent Bodies, whether soft or hard.

Thus much for the *External* Nature of *Snow*; let us next enquire into its *Essential* Nature.

Now to make a Judgment of this, is by considering, what the general Figure of *Snow* is, and comparing the same with such Regular Figures as we see in divers other Bodies, in that where we see the like Configurations, we may believe there is the like Subject: wherein, or the like Efficient *whereby* but those and these are made.

As for the Figure of *Snow*, 'tis generally one, viz. that which is above described: Rarely of different ones, which may be reduced chiefly to two general Circulars and Hexagonals, either Simple or Compounded together, more rarely, either to be seen of more than 6 Points; but if so, then not of 8 or 10 but 12. Or in single Shoots, as so many short, slender Cylindeers, like those of *Nitre*. Or by one of those shoots, as the Axle-tree, and touching upon the Centre of a Pair of pointed Icicles, joynd together as the two Wheels. Or the same Hexagonal Figure, and of the same usual breadth; but continued in thickness and profundity. All these are rare, the first described being the general Figure.

As for the Configuration of other Bodies we shall find, that there are divers which have some a less, others a more near resemblance thereto. *Nitre* is formed as is commonly known in long Cylindrical shoots, as also all *Lixivial* Salts for the most part resembling, tho' not perfectly, the several Points of each Starry Icicle of *Snow*. *Salt of Harts-horn*, *Sal Armoniack*, and some other volatile Salts, besides their main and longer shoots have others shorter Branched out from them; resembling as those the main, so these the Collateral Points of the *Snow*, but the Icicles of *Urine* are still more near: For in *Salt of Harts-horn*, altho' the Collateral shoots stand at acute Angles with the main, yet not by pairs at equal height: And in *Sal Armoniack*, altho' they stand Diametrically opposite, or at equal height; yet withal at right, not acute Angles: Whereas in the Icicles of *Urine*, they stand at equal Heights, and at acute Angles both; in both, like those of *Snow*. And it is observable that the Configuration of *Feathers* is likewise the same. The reason whereof is, because Fowls having no Organs for Evacuation of Urine, the Urinous Parts of their Blood are evacuated by the Habit or Skin, where they produce and nourish Feathers.

From whence it should seem, That every Drop of Rain aforesaid, containing in it self some Spirituous Particles, (as from the height to which they are advanced, the prolifick Verue of Rain, and its easie tendency to Putrefaction, above other Water, is argued they do) and meeting with others in their Descent, of a Saline, and that partly Nitrous, but chiefly Urinous, or of an *acide-salinous* Nature; the said Spirituous Parts are apprehended by them, and with those the Watry; and so the whole Drop is fix'd, yet not into any indifferent and irregular shape, depriving their Spirituous parts of their Motion in an instant; but according to the Energy of the Spirituous, as the Pencil, and

the Specifick Nature, or determinate possibility of the Saline Parts, as the Ruler, 'tis thus figured into a little Star.

These things somewhat further considered and cleared, may add a little to that great deal of Light which the Honourable Mr. Boyle, hath given to the Nature of Gold, the Air, and the Bodies therein contained, in his Excellent Discourses thereof.

SOC, is a Word signifying a Power, or Liberty of Jurisdiction; whence comes the Law *Latine* Word *Soca*, for a Seigniorie enfranchised by the King, with liberty of holding a Court of his *Sockmen*, or *Socagars*; that is, his Tenants whose Tenure is hence called *Socage*.

SOCAGE, is a Tenure of Lands by, or for certain inferior Services of Husbandry to be performed to the Lord of the Fee, or is a Tenure of Lands, when a Man is infeoffed freely without any Service, Word, Relief, or Marriage, and pays to his Lord such Duty as is called, *Petie Sergeanty*, &c.

There is also *Free, or Common Socage*, and *Base Socage*, or *Villanage*.

Other Divisions thereof there are in Law Books: But by the Statute 12 *Car. 2. cap. 24.* all Tenures shall be adjudged, and taken to be turned into *free and common Socage*.

SOCMANS, or *Sokemans*, are such Tenants as hold their Lands and Tenements by *Socage* Tenure.

SOLEUS, is a Muscle that helps to extend the Foot.

SOLAR Comet. See *Discus*.

SOLAR Cycle. See *Cycle of the Sun*.

SOLAR Spots. See *Spots of the Sun*.

SOLAR Year, is either *Tropical*, or *Siderial*.

Tropical Year, is that space of Time, wherein the Sun returns again to the same Equinoctial, or Solstitial Point, which is always equal to 365 Days, 5 Hours, and about 55 Minutes.

The *Siderial* Year; is the space wherein the Sun comes back to any particular Fixed Star, which is about 365 Days, 8 Hours, and 9 Minutes.

SOLE Tenant, is he or she that holds only in his or her own Right, without any other joined: As, if a Man and his Wife hold Land for their Lives, the Remainder to their Son; here the Man dying, the Lord shall not have Heriot, because he dieth not *Sole-Tenant*.

SOLET & debet. See *Debet and Solet*.

SOLID, in Geometry, is the Third Species of Magnitude, having three Dimensions, Length, Breadth and Thickness; and is frequently used in the same sense with Body. It may be conceived to be formed by the direct Motion, or the Revolution of any Superficies, of what Nature, or Figure soever.

SOLID Angle, is an Angle made by the meeting of three or more Planes, and those joining in a Point, like the point of a Diamond well cut.

SOLID Bastion. See *Bastion*.

SOLID Numbers, are those which arise from the Multiplication of a Plain Number, by any other whatsoever; as 18 is a *solid Number* made of 6, (which is *Plane*) multiplied by 3; or of 9 multiplied by 2.

SOLID Place. See *Place solid*.

SOLID Problem, in Mathematicks, is one which can't be Geometrically solved, but by the Interfection of a Circle, and a Conick Section; or by the Interfection of two other Conick Sections besides the Circle.

As, *To describe an Isosceles Triangle on a given Right Line, whose Angle at the Base, shall be triple to that at the Vertex.*

This will help to Inscribe a Regular Heptagon, in a given Circle, and may be resolved by the Interfection of a Parabola and a Circle.

The following Problem also helps to Inscribe a Nonagon in a Circle; and may be solved by the Interfection of a Parabola, and an Hyperbola between its Asymptotes: *Viz.*

To describe an Isosceles Triangle, whose Angle at the Base, shall be Quadruple of that at the Vertex.

And such a Problem as this, hath 4 solutions, and no more; because 2 Conick Sections can cut one another but in 4 Points.

How all such Problems are constructed, Mr. Halley shews in *Philosoph. Transact. N. 188.*

SOLIDITY (see *Firmness*) is a Quality of a Natural Body contrary to Fluidity, and appears to consist in the Parts of Bodies being interwoven and intangled one with another, so that they cannot diffuse themselves several ways, as Fluid Bodies can.

SOLLICITOR, is a Man employ'd to take care of, and follow Suits depending in Courts of Law, or Equity; formerly allowed only to Nobility, whose Menial Servants they were; but now too frequently used by others, to the damage of the People, and the increase of Champerty and Maintenance.

SOLSTICE, is the Time when the Sun entering the Tropical Points, is got furthest from the Equator, and before he returns back towards it, seems to be for some time at a stand, being moved in the same Parallel, and scarce making any other Lines than perfect Circles, so small is its Progress. These *Solstices* are two:

Estival, or Summer *Solstice*, when the Sun enters *Cancer* the 11th of June, making the longest Day, and the shortest Night.

And the *Hyemal*, or Winter *Solstice*, on the 11th of December, when he enters *Capricorn*, the Nights being then at the longest, and Days at the shortest; that is, in Northern Regions, for under the Equator there is no Variation, but a continual Equinox; and in the Southern Parts, the Sun's Entrance into *Capricorn*, makes the longest Day; and into *Cancer*, the longest Night.

SOLSTITIAL Colure. See *Colure*.

SOLUBLE Tartar, is made by boiling in 3 Pints of Water, 8 Ounces of Cream of Tartar, and 4 Ounces of the Fix'd Salt of Tartar, for about half an Hour in an Earthen Pan unglazed; and then when 'tis cool, filtrating and evaporating it till 'tis dry: 11 Ounces and 6 Drams of Salt will remain at the Bottom. This is the *Soluble Tartar*. 'Tis accounted a very good Aperitive Medicine.

'Tis called also a *Vegetable Salt*. Sometimes the *Tincture of Mars* is added in this Preparation, and then 'tis called *Soluble Tartar Chalybeate*.

An *Emericck Tartar*, is also made of this Soluble Tartar, and Liver of Antimony, which works as the common one.

SOLVENDO esse, a Term in Law, signifying that a Man hath wherewith to pay, or is a Person solvent.

SOLVENT, the same with Dissolvent, being any Corrosive Liquor, or *Mensstruum*, that will dissolve Bodies.

SOLUTIO Chymica, is a resolving any Body into its Chymical Principles; which are, Spirit, Salt, Sulphur, Earth and Water.

SOLUTIO continui, is a Diffolution of the Unity and Continuity of the Parts: As in Wounds, Ulcers, Fractures, &c.

SOLUTION, in Mathematicks, is the answering of any Question, of the Resolution of any Problem.

SOLUTIONE feodi Militis Parliamenti, and *Solutione feodi Burgens Parliamenti*, are Writs whereby Knights of the Shire and Burgessees may recover their Allowance, if it be denied.

SOLUTE. See *Laxative*.

SOMMONS. See *Summons*.

SOMNIFEROUS, or Sleeping Medicines, are such which consisting of ferid Sulphureous Parts, dissipate and extinguish the Animal Spirits, and hinder their Increase, whence follows Sleep. *Blanchard*.

SOPHISTICATED, the same with counterfeited, debased, or adulterated; and is usually spoken of Wines, Chymical Preparations, &c. when they are not made good in their Kinds, thro' the Avarice of the Compozer.

SOPHORIFEROUS. See *Somniferous*.

SORITES, is a sort of Argument composed of several Propositions, of which the second depends upon the first, the third upon the second, and so forward.

SORROW, is uneasiness of the Mind, upon the thought of a Good lost, which might have been enjoy'd longer; or the sense of a present Evil.

SOUND, seems to be produced by the subtiler, and more Etherial Parts of the Air, being formed and modified into a great many small Masses of Contextures, exactly similar in Figure; which Contextures are made by the Collision and peculiar Motion of the Sonorous Body, and flying off from it, are diffused all around in the Medium, and there do affect the Organ of our Ear in one and the same manner.

Sound, also appears not to be produced in the Air, so much by the swiftness, as by the very frequent Repercussions, and reciprocal Shakings of the Sonorous Body.

Sir *Isaac Newton* demonstrates, (in *Prop. 43. Lib. 2.* of his *Principles*;) That sounds, because they arise from the Tremulous Motion of Bodies, are nothing else but the Propagation of the Pulse of the Air. And this he saith, is confirmed by those great Tremors that strong and grave Sound excite in Bodies round about, as the Ringing of Bells, noise of Canon, &c.

And in another place he concludes; That Sounds do not consist in the Motion of any *Ether*, or finer Air, but in the Agitation of the whole common Air; because he found by Experiments, That the Motion of Sound depended on the Density of the whole Air.

He found by good Experiments, That a Sound moves 968 Feet, English, in a Second of Time, pag. 270. Sup-

Supposing the Air by the Pulse which causes Sound, to be in a Motion, like that of the Water when its Waves roul; he calculates the Breadth of the Pulse, or the Distance between Wave and Wave, to be in the Sounds of all open Pipes, double the Length of those Pipes, which he grounds on an Experiment of Father Merfennus, in his *Harmonicks*, that an extended String made 104 Vibrations in a Second, when it was an Unifone with the *Cfaut* Pipe of an Organ, whose Length was 4 Foot open, and 2 Foot stop'd, pag. 372.

Why the Sound ceases always with the Motion of the Sonorous Body; and why they reach the Ear equally soon, when far off, or near: He shews in *Prop. 48, Cor.* where he proves, That the Number of the Pulses propagated, is always the very same with the Number of the Vibrations of the Tremulous Body, and that they are not by any means multiplied as they go from it.

The following Properties have been observed of Sound; in many of which, there is a near Relation between it and Light. For,

1. As Light acquaints the Eye with the different Qualities, Magnitudes, and Figures of Bodies, so Sound in like manner informs the Ear of many of the same Things, in the Sonorous Body.

2. As Light presently vanishes on the Removal, or Total Eclipse of the Radiating Body, so a Sound perishes as soon as the Undulation of the Air ceases, which Motion both produces and preserveth all Sounds.

3. The Diffusion of Sound from the Sonorous Body is *Spherical*, like the Radiation of Light from its Centre.

4. A great Sound drowns a less, as a greater Light eclipses a less.

5. Too Great, Loud, or Shrill a Sound is Offensive and Injurious to the Ear, as too great and bright a Light is to the Eye.

6. Sound also (like Light) moves sensibly from Place to Place, tho' nothing near so swift as Light. It is Reflected like Light from all hard Bodies; it is hindered and refracted, by passing thro' a Denfer Medium. But it differs from Light in this, that whereas Light is always propagated in Right Lines, the Motion of Sound is almost always *Curvilinear*.

7. Sound also differs much from Light in this, that it is very much weakened by Winds, and such like Motions of the Air, which yet have no Effect on Light. For *Merfennus* Computes, that the Diameter of the Sphere of a sound heard against the Wind is near a third Part less, than when coming with the Wind.

8. A very small quantity of Body, serves to reflect the Rays of Light: as we perceive manifestly in small pieces of Looking-glasses, &c. But there appears to be necessary a Body of much larger Dimensions to Return a Sound, or to make an Echo.

9. As to Reflection of Sounds: 'Tis observed,

that if one stand near the Reflecting Body, and the Sound be not very far off, tho' an Echo be produced, yet it cannot be heard; because the Direct and Reflex Sound, enter the Ear almost at the same time: But then the Sound appears to be stronger than ordinary, and lasts longer: Especially when the Reflexion is made from divers Bodies at once; as from Arches and Vaulted Rooms, from whence the confused Bomb of such like Places arises.

And from hence probably may be deduced, the Reason why Concave Bodies are (*ceteris paribus*) fittest to produce great and clear Sounds; such as Bells, &c. for in such Bodies the Sound is very swiftly and very often Reflected from side to side, and from one Part of the Cavity to another, and the Bell hanging at liberty, this produces great tremblings and shakings of the whole Concave Body, which occasions the Sound to continue till they cease and are quiet.

10. There is one Phenomenon of Sounds that is indeed very wonderful, That all Sounds great or small, with the Wind or against it, from the same Distance, come to the Ear at the same Time.

Dr. *Holder* in his Books of the Natural Grounds and Principles of Harmony; says, That if the tremulous Motion which causeth Sound, be Uniform, then it produces a Musical Note, or Sound: But if it be Difform, then it produces a Noise.

The *Florentine* Academicks found a Sound to move one of their Miles (*viz.* 3000 *Braccia*, or 5925 Feet) in Five Seconds of Time: Therefore according to them, it moves 1185 Foot in one Second.

But Sir *Isaac Newton* found it to move but 968 Foot, in a Second of Time.

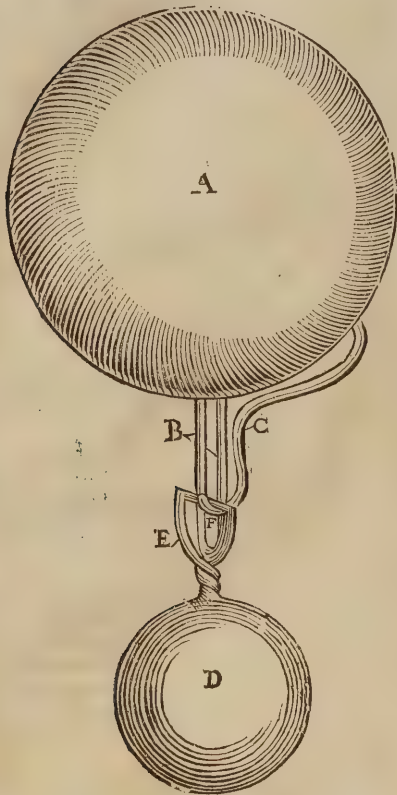
Sound, in Geography, is any great Indraght of the Sea, between two Head-lands, where there is no Passage through.

Sounding, when the Seamen try the Depth of the Water with a Line and Plummert, they call it Sounding. But their *Sounding Line*, as they call it, is a Line different from the *Deep Sea Line*, as being bigger than it, and not much above 20 Fathom in length; and is marked at 2 Fathom, with a piece of Black Leather betwixt the Stranns; so also at 3 Fathom, and at 4; but at 5 'tis marked with a piece of White Leather, or Cloth.

This Line can be used when the Ship is under Sail; but the Deep Sea Line cannot be used well, except the Ship be brought upon the Back-stays, (See *Deep Sea Line*.)

To sound the deepest Sea without a Line.

Take a Globe of Fir or Maple, or other light Wood, as A; let it be well secured by Varnish, Pitch, or otherwise, from imbibing Water; take also a piece of Lead or Stone D, considerable heavier than will sink the Globe.



Let there be a long Wire-staple B, in the Ball A, and a springing Wire C, with a bended end F; and into the said Staple, press in with your Fingers, the springing Wire on the bended end: And on it hang the Weight D, by its Hook E; and so let Globe and all sink into the Water gently, in the posture represented in the said Figure, to the Bottom, where the Weight D, touching first, is thereby stop'd; but the Ball being by the *Impetus* it acquired in descending, carried downwards, a little after the Weight is stop'd, suffers the springing Wire to fly back, and thereby sets it self at liberty to re-ascend: And by observing the time of the Balls stay under Water, (which may be done by a Watch, having Minutes and Seconds; or by a good Minute-glass; or best of all by a Pendulum vibrating Seconds; which must be 3 Foot, 3 $\frac{1}{2}$ Inches long, *viz.* between the middle of the Bullet, and the upper end of the Thread, where it is fastened, or held when it Vibrates. By this way, with the help of some Tables, you may come to know any Depth of the Sea.

Note, That care must be had of proportioning the Weight, and Shape of the Lead, to the Bulk, Weight, and Figure of the Globe, after such a manner, as upon Experience shall be found most convenient.

In some of the Trials already made with this Instrument, the Globe being of Maple-wood, well covered with Pitch, to hinder soaking in, was 5 $\frac{1}{2}$

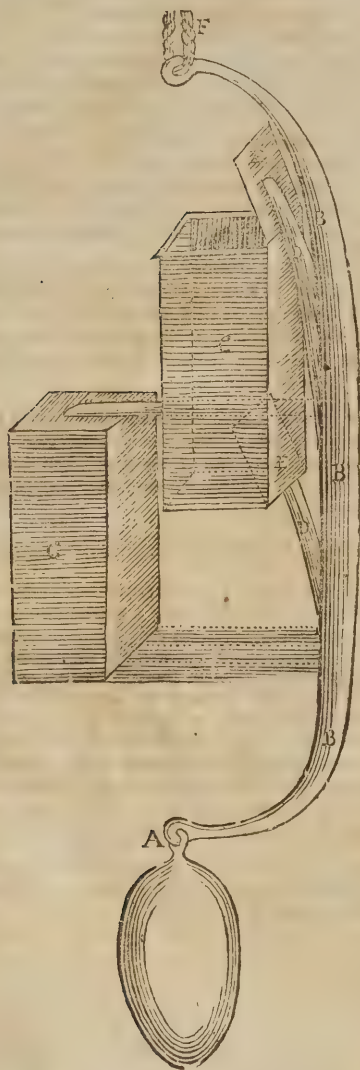
Inches in Diameter, and weighed 2 $\frac{1}{2}$ Pounds; the Lead of 4 $\frac{1}{2}$ Pounds Weight, was of a Conical Form, (but is now used of a Globous) 11 Inches long with the sharper end downwards, 1 $\frac{7}{8}$ at the Bottom, in Diameter: And in those Experiments made in the *Thames*, in the Depth of 19 Foot Water, there passed between the Immersion and Emerision of the Globe, 6 Seconds of an Hour; and in the Depth of 10 Foot Water, there passed 3 $\frac{1}{2}$ or thereabouts: From many of which kind of Experiments, it will likely not be hard to find out a Method to calculate what depth is to be included from any time of the like Globes stay under Water.

As for instance: If in the Depth of 20 Fathom, measured by the Line, the Globe stays under Water, 15 Seconds; then if the Ball stay 700 Seconds, the Depth of the Sea is 933 Fathom and 2 Foot, if the Ball be found to move equal Spaces in equal Times.

And now I'm mentioning the way of finding the Depth of the Sea, it may be of use to shew you how you may get Water from thence, which shall not communicate as it comes up with any of the Water above it.

To fetch up Water from any Depth of the Sea.

Let there be made a Square Wooden Bucket, as represented by the Figure C; whose Bottom E E, are to be so contrived, that the Weight A do sink the Iron B, to which the Bucket C, is fastned by the two Handles D D, (on the Ends of which are the moveable Bottoms or Valves E E) and whereby draws down the Bucket: The Resistance of the Water keeps up the Bucket in the Posture C; whereby the Water hath a clear thorough passage all the time it is descending; whereas, as soon as the Bucket is pulled upwards by the Line F, the Resistance of the Water to that Motion, beats the Bucket downwards, and keeps it in the Posture G; whereby the included Water is preserved from going out, and the Ambient Water kept from getting in.



By the Advantage of this, or the like Vessel, the several Degrees of Saltness of Sea-water, may be known, according to its nearness to the Top or Bottom; or rather the Constitution of the Sea-water in the several Depths of several Climates.

SOUTH Direct Dials. See *Prime Verticals*.

SOUTHERN Signs. See *Austral Signs*.

SOWNE, is a Term used in the *Exchequer*; where *Estreats that Sowne not*, are such as the Sheriff by his Industry cannot get, and *Estreats that Sowne*, are such as he may gather.

SPACE, if considered, barely in Length, between any two Beings, is the same Idea that we have of *Distance*; but if it be considered in Length, Breadth and Thickness, it is properly called *Capacity*: And when consider'd between the Extremities of Matter, which fills the Capacity of *Space*,

with something, Solid, Tangible, and Moveable, or with Body; it is then called *Extension*, so that *Extension* is an Idea belonging to Body only; but *Space* 'tis plain may be considered without it. So that *Space*, in the general signification, is the same thing with *Distance*, consider'd every way, whether there be any solid Matter in it or not.

Space therefore, is either *Absolute* or *Relative*.

Absolute Space, considered, in its own Nature, and without regard to any thing external, always remains the same, and is immoveable; but *Relative Space*, is that moveable Dimension or Measure of the former, which our Senses define by its Positions to Bodies within it; and this the vulgar use for immoveable *Space*.

Relative Space, in Magnitude and Figure, is always the same with *Absolute*, but 'tis not necessary it should be so Numerically. Thus if you suppose a Ship to be indeed in *absolute Rest*, then the Places of all things within her, will be the same *Absolutely* and *Relatively*, and nothing will change its Place. But then suppose the Ship under Sail, or in Motion, and she will continually pass thro' new Parts of *absolute Space*: But all things on Board consider'd *Relatively*, in respect to the Ship, may be notwithstanding in the same Places, or have the same Situation and Position, in regard to one another.

SPAGYRICA Medicina. See *Hermetic*.

SPAGYRICK, or *Spagyric* Art, the same with Chymistry; and a *Spagyrist*, is a Chymist. Chymistry is called the *Spagyric* Art, from *σπῆν* and *αἰσεν*, to extract, and to collect, or gather together. Because it teaches how to separate and extract the purer Parts or Substances, from mixt Bodies.

SPARADRAPUM, in a Piece of Linen ting'd on both sides, either with a thick Ointment, or Plaster, and is made this way. After you have melted your Ointment, or Plaster, dip your Linen in it, extend it, and keep it for use. *Blanchard*.

SPASMODICKS, are Medicines against Convulsions.

SPASMOLOGIA, is a Treatise of Convulsions.

SPASMUS, is any Convulsive Motion: *Cardan* makes two sorts of Convulsive Affections, viz. *Tetanus Spasmus*; and by the former he understands a constant Contraction, whereby the Member becomes rigid and inflexible; by the latter he understands sudden Concussions and Motions, which cease and return Alternately. *Blanchard*.

SPASMUS Cynicus, a sort of Convulsions, whereby the Mouth is distorted on one side thro' the Contraction of the Muscles.

SPECIALITY, in Law, is most commonly taken for a Bond, or Bill, or such like Instrument.

SPECIES, in Metaphysics, or Logick, is an Idea, that relates to another more general one, to which it is subservient, and has only under it *Individuals* and *Singulars*.

SPECIES in Algebra, are those Letters, Notes, Marks, or Symbols, which represent the Quantities in any Equation or Demonstration. This short and advantageous way of Notation, was first Introduced by *Vieta*, about the Year 1590, and by it he made many discoveries in the Process of *Algebra*, not before taken notice of.

The Reason why *Vieta* gave this Name of *Species*, to the Letters of the Alphabet subservient to *Algebra*, and why he calls it *Arithmetica Species*:

ofa: Seems to have been in Imitation of the *Civilians*, who call Cafes in Law, but abstractedly between *John a-Nokes* and *John a-Stiles*, or between *A, B* and *C*, supposing those Letters to stand for any Persons indefinitely; such Cafes, I say, they call *Species*. Wherefore since the Letters of the Alphabet will also as well represent Quantities, as Persons, and that too Indefinitely one Quantity as well as another, they may properly enough be called *Species*; that is Symbols, Marks, or Characters. From whence the *Litteral Algebra* is frequently now a-days called *Specious Arithmetick*, or *Algebra in Species*.

SPECIES, in Medicine, are properly the Simple Ingredients in the Druggists, or Apothecaries Shops, out of which compound Medicines are made: But the Writers of *Pharmacy*, do usually give this Name to some *Aromatick*, or *Cathartick Powders*, because probably they were formerly kept ready prepared in the Shops, to form Electuaries, Tablets, Pills, &c. as some are still.

SPECIES, *Visibles*, are those wonderfully fine superficial Images of the Bodies which the Light produces, and delineates in their due Proportion and Colours in the Bottom of our Eyes. These the *Aristotelians* would have to be Immaterial, but a recco Experiments prove, That tho' they are admirable subtilie, yet they are really corporeal.

SPECIFICK is in general, whatever is peculiar to any distinct Species of Things, and which distinguishes them from all others of different Species. Therefore the Logicians say, That in every good Definition of any thing, the Specifick Difference ought always to be inserted. Hence,

SPECIFICK Gravity, is the Appropriate and peculiar Gravity or Weight, which any Species of Natural Bodies have, and by which they are Plainly Distinguishable from all other Bodies of Different kinds. By some 'tis not improperly called *Relative Gravity*, to distinguish it from *Absolute Gravity*, which encreases in Proportion to the Bigness of the Body weighed. Thus, if any Body weigh a Pound, one as big again will weigh two Pounds: And let the Bodies be of what Nature or Degree of Specifick Gravity soever, a Pound of one will be as much as a Pound of the other, Absolutely considered: Thus as is commonly said, a Pound of Feathers, is as heavy as a Pound of Lead. But if you consider Lead and Feathers Relatively, the Specifick Gravity of the Former, will be much greater than that of the Latter. Or Lead, or Bulk, for Bulk will be much heavier than Feathers: And Gold heavier than Lead, &c.

'Tis of so great Advantage in many respects as will appear below to find truly the Specifick Gravities of Bodies, that many Curious Ways have been thought of, and experimented for this Purpose. As by forming exact Cubes of different substances, and taking their Weight accurately in Nice Scales; and by melting Metals of different Gravities, and then casting them in Moulds of the same Dimensions. But for Practice and Universal use, nothing is better than the following Method, which is to weigh any Body first in Air, and then in Water; which latter being considerably a Denfer Fluid than Air, will buoy up the Body immersed in it in part; and will consequently make it weigh less there than in the Air. And if after this you subtract the Weight found in the Water, from the former in the Air; a Remainder or Difference will be found, which is the Weight of

as much Water as is equal to the Bulk of the Body. As *Archimedes* hath demonstrated Mathematically, and *Mr. Boyle* Physically and Experimentally, in his *Hydrostatical Paradoxes*. So that by this means having two Bodies, one Firm, and the other Liquid, with the Weight of each part, 'tis very easie to find the Proportion that one hath to the other, Bulk for Bulk; by only dividing the greater by the lesser; for the Quotient will shew the Specifick Gravity of the heavier Body compared with as much Water as is equal to it in Bulk. As if the Quotient be 2, 3, 6, or 19; the Body will accordingly be twice, thrice, 6, or 19 times as heavy as Common Water.

The Application of which Rule, and the great Advantages which may be made of the use of it. You will find in the following Problems or Experiments.

I. To find the Specifick Gravity of such Bodies as will sink in Water, and not be dissolved by it.

Having ready a Pair of good small Scales which will turn with the $\frac{1}{4}$ of a Grain, (or $\frac{1}{8}$ Part may do well enough) drill a small Hole in the middle of one Scale, thro' which put a Horse-hair about a Foot in length with a Knot at the upper end of it, and a Loop at the other, put as much Horse-hair in the opposite Scale, as will serve to Equiponderate the other, and having well adjusted your Scales: Weigh first the Body in the Air, carefully turn the Weight into Grains, ('twill be best to use Troy Weight) and write down the Number on a piece of Paper. Then fasten the Body to the Horse-hair, and leisurely immerse it into a Vessel of Rain; or Spring Water, and putting Weights into the opposite Scale, find its Weight exactly in the Water, (where it must swim about freely, and not touch the Bottom or Sides, of the Vessel.) Turn also this Weight into Grains; and subtract it from the former Weight in Air, and note the Remainder; by which Remainder divide the first found Weight in Air; and the Quotient will be the Proportion that the Body bears to Water; that is, will shew the Sepcick Gravity in respect of Water, which is pitched on as a Standard to compare it by.

Exámple.

A Piece of white Marble weighed in Air 1169 Grains, and in Water 738 Grains; which subtracted from the former Weight left 431 Grains; by which Remainder dividing the Weight in Air, 1169, the Quotient was $2\frac{7}{11}$, which is the Specifick Gravity of Marble, in respect of as much Water as is equal to it in Bulk.

N. B. If you practice this much, 'twill be best to hang your Scales upon a Gibbet, or some other Rest, where they may hang freely; and so you will have both your Hands at liberty for more nicely adjusting the Balance, and your Arm will not be weary with holding the Scale; and be sure that the Scales play freely, and are no way tangled, and that you do not wet your Weights, nor Scales; for a little carelessness may produce great Errors in such Cases: Let also the Body hang a while in the Water before you weigh it, and move it up and down, and gently knock it against the Sides of the Vessel, to extricate it from all Bubbles of Air, that else sticking to it, may buoy it up a little, and consequently

frequently induce you to mistake its Weight. You should also have a small pair of Pliers, or Tongs, to take up your Grains withal, lest you let them fall; which with your Fingers you may be apt to do, and so occasion your self a needless trouble.

'Twill be convenient also to make a little Net of Horse-hair (of small Mathes) to hold round, or small Bodies, that cannot conveniently be fastened with one Hair only; be sure always to Equipoise your Scales, before you begin to weigh.

The Uses of this Experiment.

1. Since common Stone, Marble, and Rock-Chrystal, &c. (See the Table of *Specifick Gravity*) are to Water, but as $2\frac{1}{2}$ (or 5 to 2;) if you find a piece of strong Matter, whose *Specifick Gravity* exceeds that Proportion, you may conclude, That it hath in it something of a Mineral, or Metalline Nature, in proportion to its excess above the Weight of common Stone.

2. By this Method also, a Body may be examined, whether it be of a stony Nature, or not? So *Coral* and *Pearls*, will be discovered to approach rather to a Stony, than to a common Vegetable, or Animal Nature; and *Bezoar*, and the Stones found in the Bladders of Men, or other Animals, will by their great lightness shew themselves of a very different Constitution from ordinary Stones.

3. By this Method, you may make an Estimate of the Goodness of several Stones, or Bodies of the same Kind, or Denomination: For having found the Gravity of such as are Excellent, all others of lesser Goodness, may easily be distinguished, as they are any way diverse from that Standard.

4. And thus also Genuine Stones, or Minerals, may be easily distinguished from false ones; and counterfeit Money readily known from Sterling, tho' never so well wash'd over, or gilded; for having by your own Trials, or by the help of such a Table as is here annexed, gotten the *Specifick Gravity* of such Stones, Gems, or Corns, as are True and Genuine, let that be the Standard whereby to estimate others by; which last use, is of universal Advantage, and may assist the Physician, Apothecary, or Druggist in the Drugs, the Jeweller in Gems, and Precious Stones, and the African Merchant, in the Choice of the Sand or Dust Gold, which is often Counterfeit.

Had the Curious *Dampier* known this Method, he might perhaps have trucked and gotten some of the Indian yellow Rings at the *Bashee Island*: (*vid. Dampier's Travels*, Edit. 2. Chap. 15. p. 427.) which it appears he had no great Encouragement to do, not being able exactly to distinguish whether they were Gold or not.

II. To weigh Mercury, or such heavy Fluids that will sink into, and not mingle with Water; as also the Fragments of, or small Precious Stones, Pearls, &c. and all Powders that are heavier than Water, small Sands, Filings of Metals, Gold Grains, or Dust, and such like small things about which a Horse-hair cannot be fastened.

To provide a small Glass Jar, or a little Silver or Brass Cup (but Glass is best when it can be had) with two Handles or Ears to it, and that shall hold

about an Ounce and a Half, or two Ounces of Water; and weighing it carefully in the Air first, note exactly its Weight, (which lay by in some ready Place) then also find the Glass's Weight in Water, and lay the Weights carefully by, by themselves; and if you intend to make frequent use of this Practice, 'twill be better to get two pieces of Lead, one of the weight of the Glass in the Air, the other of its weight in Water, which will be always in readiness. This done, put the Mercury, Liquor, or Powder you intend to weigh into your Glass, (which may be called the *Hydrostatical Bucket*) and putting into the opposite Scale the before-found weight of the Bucket, find the weight of the Matter in Air, and write it down (as in *Experiment 1.*) then take the Bucket out of the Scale, and pour into it, by degrees (that it may mingle well with it, and exclude all Air) Water enough to cover the Matter, or wet it thoroughly; and then putting into the opposite Scale the weight that answers to the Bucket in Water, fasten your Bucket by a Horse-hair to your Scale, and let it down gently into a Vessel of Water, and so find its weight carefully in the Water; then (as in *Experiment 1.*) Subtract that from the weight in Air, and by the Remainder divide the weight in Air, and the Quotient will be the *specifick Gravity* of the Liquor, Powder, &c. to as much Water as is equal to it in Bulk.

III. To weigh such solid Bodies as will dissolve in, or be injured in Water.

Weigh them (as before) first in Air, and then instead of Water, use the clear Oil or Spirit of Turpentine, which is cheap enough, and may be had at any Druggists, in which no Salts, nor Vitriols, nor Acid Sublimates will dissolve; and proceed in all things, as if you weighed the Body in Water; and so you will obtain the *specifick Gravity* of the Body in respect of Oil of Turpentine; which may be the Rule for these sorts of Bodies, as common Water was for the others. And this way will have the same Use as the other: For having at any time weighed a piece of any Body (as suppose *Mercurius dulcis*) in the Oil, that you know is good; that may be your Standard to try more of the same Sublimate for the future; for if you find it hath not the same *specifick Gravity* that the former (which you weighed) had, but is lighter, you may conclude it hath not its due proportion of Mercury; and consequently, is adulterated, as indeed that which is Sold in the Druggists Shops often is; and therefore those that deal much in such things, may make a Table (from their own Experience) of the weights of Bodies in respect of Oil of Turpentine, which will be of ready Use to them: And then their *specifick Gravity* in respect of Water (by a little Calculation) may be easily enough found by the following Experiment.

IV. To find the *Specifick Gravity* of Liquids and Fluids.

1. These are of two sorts, and consequently 'twill be expedient to be furnished with a double Standard to examine them by. In order therefore to find the weight of Common Water, Beer, Ale, Burning Spirits, or any Vegetable or Animal Liquors; get either a piece of Amber or Red hard Seal-

ing Wax, or a Roll of common Brimstone, and weigh it first in the Air, and then in the Liquor you intend to examine; and (proceeding as in *Exper. 1.*) you will thence find the specifick Gravity of that Body in respect of the Fluid, and consequently of the Fluid in respect of that Body: And therefore pitching on that Body as your common Standard, 'tis easie to compare the Weight of all Liquids of the first kind in reference to it; for those in which the Body weighs less, will be the *Heavier Liquors*: And those in which it weighs more, lighter, in proportion to the decrease or increase of the weights of your Standard in the Fluid.

2. But to find the Weights of strong briny Seawater, saline Menstrua, and all acid Spirits and Stygian-waters, as the Oil of Vitriol, Aqua-fortis, &c. 'twill be necessary to employ a heavier Body for your Standard; and therefore in such, weigh either a piece of Rock-Crystal, or which will do as well, white Marble, or a piece of solid Glass; such as the Tobacco stoppers of that Metal, &c. which being more ponderous, will sink in these Liquors, in which Amber or Wax will not; and proceed as above in the former part of this Experiment.

U S E S.

1. By these Experiments, the goodness of all kinds of Liquors may be examined: For, as to the first kind of Liquors before-mentioned, 'tis probable, the more fine and spirituous they are, the lighter they will be, and the more your piece of Amber or Sealing-wax will weigh in them; which having once weighed in some Liquor of the kind, that you were assured was good, the weight of your Piece in that, may be the Standard to compare others by. But the latter sort of Liquors will require a contrary way of estimation; for the more ponderous they are, the better they may be judged to be; and consequently, the less your piece of Marble or Glass weighs in them, the greater degree of goodness you may conclude them to contain. By weighing also the Solid in a parcel of any kind of these that you have proved as good, its weight may be the Standard, to compute the goodness of those of the same sort of Liquors.

2. Hence also you may most accurately discover, whether you are imposed upon by the Merchant, Vintner, or Distiller, &c. in Quantities of Wine or Spirits which you have bought on the Credit of the Sample that was shewed you to examine; for if you find that the specifick Gravity of the whole Vessel sent you home, is different from that parcel which you tried, you may be assured, that 'tis some way mix'd and adulterated.

3. The Chymist also may by this means adjust his Menstrua for the dissolving of Mineral or Metallick Bodies to the best advantage; by so tempering them, (either by weakening their Strength, or increasing it) that they shall prove the most expedite Dissolvents: For many know very well, that a Menstruum may as well be too strong, as too weak: And therefore the specifick Gravity of an apt Menstruum may perhaps be the best guide to portion another for the same purpose.

V. To find the Solid Content of any small Body, tho' never so irregular, (if it be heavier than Water) by weighing it in Water.

Mr. Boyle, by many curious Trials, found that a Cubic Inch of Water is equal in weight to about 256 Grains, or half an Ounce, and 16 Grains Troy: Which Number of Grains is very happy for such Trials, because of its many aliquot Parts; and also, because every 32 Grains answers to just $\frac{1}{8}$ of an Inch.

Suppose therefore you weigh a Body first in Air, and then in Water, and shall find it in the latter Medium to lose of its weight in Air just 256 Grains or $\frac{1}{2}$ Ounce 16 Grains, you may conclude that the solid Content of that Body is just one Cubic Inch; and if it lose but $\frac{1}{2}$ or $\frac{2}{3}$, or $\frac{3}{4}$ of that number of Grains, the Content is $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$ of a Cubick Inch. So on the other side, if it lose more than 256 gr. as 2, 3, or 4 times that weight; its solid Content will be accordingly 2, 3, or 4 Cubic Inches. The like is true of all other proportional Decrements of the Bodies weight, in comparison of 256, the Standard for one Cubick Inch.

The reason of this Process is clear enough, if we consider that every Body weighed in Water, loses there so much of its weight as the Water amounts to, which is equal to that Body in Bulk; or in other words, That it weighs less in Water, than in Air, by the weight of as much Water as is equal to the Body in bulk, which is the Fundamental Theorem of all Hydrostaticks, and is Mathematically demonstrated by Archimedes, and Physically by Mr. Boyle, in his *Hydrostatical Paradoxes*.

And since also, as is before declared, a Cubick Inch of Water weighs exactly 256 Grains, what every Body loses in Water just that Sum (of its former weight in Air) must needs be in Solid Content equal to a Cubick Inch; for the Decrement of its weight is equal to the weight of as much Water as its bulk takes up, (by the universal Theorem) and that is found to be in weight 256 Gr. which is exactly equal to one Cubick Inch; therefore the Content of that Body is just so much.

U S E S.

This is more exact than any Mensuration can be for small Bodies; 'tis very expeditious, and may be of good use (besides its Curiosity) in a great many Cases, as is obvious to any thinking Person.

VI. To find the Solid Content of a Body lighter than Water, by its weight in that Medium.

This Experiment will have two Cases.

1. When the Body to be measured will not be injured by the Contract of the Water, Weigh the Body in Air; and then take a piece of Lead, or some such heavy Metal, and of a known and even weight, (as suppose a Penny-weight or Half a Penny-weight, &c. to avoid Fractions) and capable of sinking your Body in Water. Weigh your Lead in Water, and Subtract that weight from its weight in Air, and keep the Remainder as the Specifick weight of your piece of Lead in Water. This done, fasten your Lead with Horse-hair to the

the Body you intend to measure; and weighing the Aggregate also in Water, Subtract this last weight from that just now found in Air, and the difference will be the Specifick weight of the said Aggregate in Water; and lastly Subtract from it the Specifick weight of the Lead alone in Water, and the remainder is the weight of the light Body you intend to measure, or to find the solid Content of; which is easily done by the Process in the close of the 5th Experiment: For this last found weight being divided by 256, or by its Half, &c. will accordingly give you the Body's Solid Content in entire, half, or quarters of Cubick Inches.

Example.

Because this last Process hath something of difficulty in it, (especially to a young Hydrostatician) I will subjoin the following Example, which will serve not only to enlighten this, but many other Rules of this nature:

- | | |
|--|-------------------|
| | Gr. |
| 1. A Cube of Oak which was made with great Exactness by a good Workman, | 192 $\frac{1}{2}$ |
| 2. A piece of Lead just $\frac{1}{2}$ an Ounce (to make it sink) weighed, | 240 |
| 3. The Lead in Water weighed | 220 |
| Which Subtracted from 240, the Lead's weight in Air, left for its Specifick weight in Water. | 20 |
| 4. The Aggregate of the Wood and Lead's weight in Air was | 433 $\frac{1}{2}$ |
| 5. The weight of the Aggregate in Water was | 162 |
| 6. Which Subtracted from the weight of the Aggregate in Air 433 $\frac{1}{2}$ left | 271 $\frac{1}{2}$ |
| 7. The Specifick weight of the Lead in Water (<i>viz.</i> 20) being Subtracted from which last remainder I left for the weight of the Cube in Water | 251 |
- Which last Number wants but 4 Gr. and a $\frac{1}{2}$ of 256, the Standard before mentioned, *viz.* Of the weight in Grains of a solid Inch of Water.

C A S E 2.

When there is danger of injuring the Body by its either being dissolved by Water, or else admitting it too much into its Pores, you may use Oil of Turpentine instead of Water; only instead of the Standard 256 Grains for a Cubick Inch, you must use 221, for that Mr. Boyle found a Cubick Inch of that Oil to weigh; and therefore proceed altogether as in the last Case, only use Oil instead of Water, and divide the weight of your Solid in Oil of Turpentine, by 221, and the Quotient will give the Contents of it in Cubick Inches or parts of an Inch.

You may also in some cases, having first found the weight of the Body you would examine in Air, over-lay it carefully with a Coat of Bees-wax, to keep it from being injur'd by the Water, and having then found the weight of the Bees-wax used to cover it, (which is easily done by weighing the Body again when covered, and then from that weight Subtracting the weight of the naked Body

before found) sink it in Water with a piece of Lead as before taught; and observing the weight of the Aggregate, then proceed with the remaining part of the Experiment, as is Case 1.

VII. To find the weight of any Floating Body, tho' never so great, by knowing what part of it is under Water.

Suppose a Ship should have under Water a part of its Hull equal to 100000 Cubick Feet, I chuse such a round Number to avoid Fractions, (how to find the Content of the Part of a Ship, that is under Water doth not belong to this Place, but it may be easily enough done by one versed in solid Mensuration). 'Tis found by Experience, that a Cubick Foot of Water weighs 76 Pound Troy, and Archimedes hath demonstrated, That as much Water as is equal in bulk to the part of the floating Body that is under Water, is in weight equal to the whole floating Body. Therefore 'tis plain, That to solve this Problem, you need only Multiply 100000 by 76, (which is 7600000) and the Product is the weight of the whole Ship in Pounds Troy.

A Table of Specifick Gravity of Bodies in Proportion to Water, from Mr. Boyle and my own Experiments.

	Proportion.
Amber	as 1, 04 to 1
Agate	as 2, 64 to 1
Allom Stone	as 2, 18 to 1
Antimony (Hungarian)	as 4, 07 to 1
Antimony Crude, which seem'd to be very good	as 4, $\frac{1}{2}$ to 1
Regulus, made of that above, and the common way	as 6 $\frac{1}{2}$ to 1
Cinnabar of Antimony	as 7 $\frac{1}{2}$ to 1
Bezoar Stone	as 1, 48 to 1
— Another	as 1, 64 to 1
A fine Oriental one	as 1, 53 to 1
— Another	as 1, 34 to 1
A piece of cast Brass	as 7 $\frac{3}{4}$ to 1
An old Brass Gold Weight (mark'd XXXIII.)	as 8, 83 to 1
A piece of hammer'd Brass	as 8, 66 to 1
Coral red	as 2, 63 to 1
Chrystal	as 2, 21 to 1
Cornelian	as 3, 29 to 1
Calculus humanus	as 1, 72 to 1
— Another	as 1, 47 to 1
— Another	as 1, 57 to 1
Coco-shell	as 1, 34 to 1
Native Crabs-Eyes	as 1, 89 to 1
Artificial Crabs-Eyes	as 2, 48 to 1
Calx of Lead	as 8, 94 to 1
Copper Stone	as 4, 09 to 1
Copper Ore	as 4, 15 to 1
Copper Ore Rich	as 4, 17 to 1
An old Copper Half-penny, (Charles 2d's Coin)	as 9, to 1
Common Cinnabar	as 8, $\frac{1}{2}$ to 1
Cinnabar of Antimony	as 7, 03 to 1
— Another Piece	as 7, 06 to 1
Coral white	as 2, 54 to 1
Chalk, found by Dr. Slare to be	as 1, $\frac{3}{4}$ to 1
Gold Ore not Rich from India	as 2, 63 to 1
— Another	— An-

—Another lump of the same	as 2, 55	to 1
An old Jacobus	as 18	$\frac{1}{2}$ to 1
A piece of Gold Common-wealth Coin	as 17	$\frac{1}{2}$ to 1
The Gold of a Seal	as 16	1 to 1
Granatiminera	as 3, 1	to 1
Granate Bohemian	as 4, 36	to 1
A piece of common Glafs Coffe- Dish of a brown colour	as 1, 76	to 1
Hematites English	as 3, 76	to 1
A Hone to Set Razors on	as 2, 96	to 1
An Icicle broken from a Grotto, found by Dr. Slare to be	as 1, 19	to 1
Ivory	as 1, 91	to 1
A piece of burnt or roasted Iron Ore	as 3	$\frac{1}{2}$ to 1
A piece of hammer'd Iron (per-haps part Steel)	as 7	$\frac{3}{4}$ to 1
Lapis manati	as 2, 86	to 1
Lapis Lazuli	as 2, 98	to 1
Lapis Calaminaris	as 4, 92	to 1
Lapis Judaicus	as 2, 69	to 1
Lead Ore	as 7, 14	to 1
Lead (an ordinary piece)	as 11	$\frac{1}{2}$ to 1
—Another	as 11, 42	to 1
Lead Ore from Cumberland Rich	as 7, 54	to 1
A good Load-stone	as 4, 75	to 1
—Another	as 4, 93	to 1
Marcafites	as 4, 45	to 1
—Another from Stalbridge	as 4, 50	to 1
Mercury revived from the Ore	as 14	to 1
Manganefe	as 3, 57	to 1
Mineral (Cornish) shining like a Marcafite	as 9, 06	to 1
Marble white	as 2, 7	to 1
Ofteocolla	as 2, 24	to 1
Pearl (a large one)	as 2, 51	to 1
Fine Orient Seed Pearl	as 2, 75	to 1
Rhinoceros-horn	as 1, 99	to 1
Sulphur vive	as 2,	to 1
—Another very fine from Germany	as 1, 98	to 1
Slate (Irish)	as 2, 49	to 1
A Silver Half-crown (K.W's Coin)	as 10, 75	to 1
Silver Ore, choice from Saxony	as 4, 97	to 1
—Another piece	as 7	to 1
A Whetstone, not fine, such as Cutlers use	as 2, 74	to 1
A round Pebble-stone (within of Flint)	as 2, 61	to 1
Talc, a piece like Lapis Amianthus	as 2, 28	to 1
Talc (Venetian)	as 2, 73	to 1
Talc (Jamaican)	as 3,	to 1
New English Tin Ore, Mr. Huberts	as 4, 8	to 1
Tin Ore, black, rich	as 4, 18	to 1
Another choice Piece	as 5,	to 1
Tutty	as 5,	to 1
Tin Glafs	as 9, 55	to 1
Vitrum Antimonii per see	as 4, 76	to 1
Vitriol Engl. a very fine Piece	as 1, 88	to 1
Unicorns-horn, a Piece	as 1, 91	to 1
Human Blood, Mr. Boyle found	as 1, 33	to 1
Serum of the Blood to Water, he found to be	as :: 302	to 253
Asphaltum, Mr. Boyle,	as 1, 14	to 1
Scotch Coal	as 1, 13	to 1

A Table of Specifick Gravity, from Phil. Trans. N. 169.

Pump water	1000
Dried Firr	546
Dried Elm	600
Dried Cedar	613
Dried Walnut Tree	631
Crab-tree (meanly dry)	705
Ash, meanly dry, and fappy	734
Heart Ash, pretty well dry'd	845
Maple dry	755
Yew of Knot or Root 16 Years old	760
Beach meanly dry	854
Oak, very dry, and almost Worm-eaten	753
Oak a Year old, but fappy	870
Oak (Heart) found and dry	929
Another Piece	932
Logg-wood	913
Box	1031
Red-wood	1031
Speckled Virginia-wood	1313
Lignum Vite	1327
Pitch	1150
Pitt-Coal of Staffordshire	1240
Glafs Bottle	2666
Stone Bottle	1777
Ivory	1826
Alabaster	1872
Brick	1979
Heddington-stone, of the soft lax kind	2029
Burford-stone, an old dry piece	2049
Paving-stone, a hard sort from about Blaidon	2460
Flint	2542
Black Italian Marble	2704
White Italian Marble	2718
Block Tin	7312
Copper	8843
Lead	11345
Quick-silver	14019
Quick-silver, another parcel more careful-ly weigh'd	13525
Claret	993
Urine	1033
Moil Cyder, not clear	1017
Sea-water, clear	1028
College Plain Ale	1028
Milk	1031
Sack	1033
Beer Vinegar	1034

A Table of Specifick Gravity, by Mr. J.C. from Phil. Trans. N. 199.

Cork	237
Sassafras-wood	482
Juniper-wood (dry)	556
Plum-tree (dry)	663
Mastic	849
Santalum Citrin	809
Santalum Album	1041
Santalum Rubrum	1128
Ebony	1177
Lignum Rhodium	1125
Lignum Asphaltum	1179
Aloes (I believe he means the Wood)	1177
Succinum Pellucidum	1065
Succinum Pingue	1087
Fet	1238
The	

	Proportion.
The Top-part of <i>Rhinoceros's</i> Horn	1242
The Top-part of an <i>Ox-horn</i>	1840
The Blade-bone of an <i>Ox</i>	1656
<i>Calculus humanus</i>	1240
Another	1433
Another	1664
Common <i>Brimstone</i>	1811
<i>Borax</i>	1720
	1822
<i>A spotted fatitious Marble</i>	1928
<i>A Gally-pot</i>	2092
<i>Oyster-shell</i>	2590
<i>Murex shell</i>	2270
<i>Lapis Manati</i>	2322
<i>Selenitis</i>	2341
<i>Wood petrified in Lough Neagh in Ireland</i>	2510
<i>Onyx-stone</i>	2508
<i>Turcois-stone</i>	2512
<i>Englifo-Agate</i>	2515
<i>Grammatias Lapis</i>	2568
<i>Cornelian</i>	2605
<i>Corallachates</i>	2657
<i>Talc</i>	2686
<i>Coral</i>	2631
<i>Hyacinth (Spurious)</i>	2666
<i>Jasper (Spurious)</i>	2659
<i>A Pellucid Pebble</i>	2704
<i>Chryſallum Diſſiachaſticum</i>	2842
<i>A Red Paſte</i>	2894
<i>Lapis Nephriticus</i>	2913
<i>Lapis Amiantus, from Wales</i>	3054
<i>Lapis Lazuli</i>	3288
<i>A Hone</i>	3598
<i>Sardaketes</i>	3978
<i>A Granate</i>	4589
<i>A Golden Marchaſite</i>	3500
<i>A blue Slate, with ſhining Particles in it</i>	2650
<i>A Mineral Stone, yielding one part in 160 of Metal</i>	8500
<i>The Metal Extracted thence</i>	7464
<i>The Silver Ore of Wales (as it is reputed)</i>	11087
<i>The Metal thence Extracted</i>	9859
<i>Biſmuth</i>	7065
<i>Spelter</i>	8362
<i>Spelter Soder</i>	7643
<i>Iron of a Key</i>	7852
<i>Steel</i>	8100
<i>Caſt Braſs</i>	8280
<i>Wrought Braſs</i>	8349
<i>Hammer'd Braſs</i>	9075
<i>A falſe Guinea</i>	18888
<i>A true Guinea</i>	19535
<i>Sterling ſilver</i>	9468
<i>A Braſs Half-crown</i>	12071
<i>Electrum (a Britiſh Coin)</i>	17548
<i>A Gold Coin of Barbary</i>	18420
<i>A Gold Medal from Morocco</i>	18261
<i>A Mentz Gold Ducat</i>	18893
<i>A Gold Coin of Alexander's</i>	19100
<i>A Gold Medal of Queen Mary</i>	19125
<i>A Gold Medal of Queen Elizabeth</i>	19636
<i>A Medal eſteemed to be near fine Gold</i>	

SPECIFICK Medicines, are ſuch as have a Peculiar Vertue againſt ſome Diſeaſe; as the *Quinquina*, or *Cortex Peruviana*, hath to cure Intermitting Fevers: And Phyſicians mention in their Books three kinds of Specifick Medicines.

1. Such as are Eminently, and Peculiarly Friendly to this or that Part of the Body, as to the Heart, the Brain, the Stomach, &c.

2. Such as do ſeem to Attract, Expel, or Evacuate ſome determinate Humour by a kind of Specifick Power, that they are endowed with. Thus Jalap Purges, Watry Humors, Rhubarb Bile, &c. And;

3. Such as have a Virtue to cure by ſome hidden Property, this or that Particular Diſeaſe.

That there are ſuch Medicines as theſe, in the latter and moſt proper Senſe of the Word, Mr. Boyle makes very probable, by theſe Reaſons.

1. The Concurrent Teſtimony of Experience both Ancient and Modern. *Galen* promiſed a Book on this Subject, but it is loſt if he ever Wrote it.

2. 'Tis manifeſt that Inconſiderable Quantities of Poiſon can do very great miſchief, and produce great and diſmal Effects without any manifeſt Quality appearing to be in them: And therefore by Parity of Reaſon, one would conclude, Medicines may be found which ſhall heal and do good the ſame way.

3. The Teſtimony of Phyſicians themſelves who in their Writings, do always mention ſome one Specifick or other, which they believed was really ſuch.

And certainly it would be well worth while to keep an account of the Operations of as many pretended Specificks, as can come to any Phyſicians knowledge, and by no means to reject all things of that Nature, becauſe a Reaſon cannot preſently be given for the Cure; for if we ſhould always do ſo, we muſt reject almoſt every thing.

SPECILLUM, is a Surgeons Inſtrument called uſually a *Probe*, by which he ſearches the Depths, Windings, &c. of Wounds and Ulcers.

SPECULUM Lucidum. See *Septum Lucidum*.
SPECULUM Oculi, the Apple, or Pupil of the Eye. See *Aranea Tunica Oculi*.

SPECULUM Oris. See *Dilatatorium*.

SPELL, a Sea Word ſignifying to let go the Shears and Bowlings of a Sail, (chiefly the Miſſen) and Bracing the Weather Brace in the Wind, that the Sail may lie looſe in the Wind: This is done, when a Sail hath too much Wind in it, and there is Danger of Wronging the Maſt. This Word is moſtly uſed about the *Miſſen-sail*. For there inſtead of ſaying take in the *Miſſen* and *Peek it up*; they ſay in one Word *Spell the Miſſen*.

To do a *Spell* alſo with them, ſignifies doing any Work for a ſhort time, and then leaving it: Therefore a *Freſh Spell* is when Freſh Men come to Work; and to give a *Spell*, is all one as to ſay, Work in ſuch an ones Room.

SPENT, The Seamen ſay a Ship hath *Spent* any Maſt, or Yard, when it is broken down by foul Weather, or any ſuch accident: But if it be done by an Enemies Shot in Fight, they ſay ſuch a *Yard or Maſt was ſhot by the Board*.

SPERMATICK Veſſels, and *Parts*, are thoſe Arteries and Veins, which bring the Blood to, and convey it from the Teſticles: Likewiſe thoſe Veſſels through which the Seed paſſes: Likewiſe

all whitish Parts of the Body, which because of their Colour, were anciently thought to be made of the Seed: Of this sort are the Nerves, Bones, Membranes, Gristles, &c.

SPERMATOCELE, a Rupture caused by the Contraction of the Vessels which eject the Seed, and its falling down into the *Scrotum*.

SPHACELUS, is a sudden Extinction of Life and Sense in every Part.

SPHÆNOIDALIS Sutura, is a Suture that surrounds the *Os Sphenoides*, separates it from the *Os Occipitis*, from the *Os Petrosus*, and from the *Os Frontis*.

SPHÆNOIDES, is a Bone of the *Cranium*, common both to the Skull and upper Jaw; it is of a very irregular Figure; and is situated in the middle of the Basis of the Skull, and is joined to all the Bones of the *Cranium*, by the *Sutura Sphenoidalis*, except in the middle of its Sides, where it is continued to the *Ossa Petrosa* as if they were one Bone. This Bone has a small Protuberance in the middle thereof, from which the Muscles of the *Uvula* arise: On its Inside it has 4 Processes called *Clinoides*. Betwixt the two Tables of this Bone, under the *Cella Turica*, there is a *Sinus* divided in two in the middle, which opens by two Holes into the Cavity of the Nostrils. In this Bone some say, there are also 12 Holes; by the first and second pass the Optic Nerves; by the rest pass other Nerves for the Motion of other Parts, as also of Veins and Arteries.

SPHENOPALATINUS, is a Muscle of the *Gargaveon*, which descends from a round fleshy Origination at a Process of the *Os Sphenoides*, which is in a direct Line between the *Ala Vespertilionis*, and *Processus Styloides*, thence it becomes a round fleshy Belly in half its Progress, grows less again near its lateral Insertion to the Posterior Part of the *Gargaveon*.

This with its Partner acting, draw the *Gargaveon* with the *Uvula* upwards and backwards; which hinders the masticated Aliment from Regurgitating through the *Foramina Narium* in *Deglutition*.

SPHÆNOPHARINGÆUS, is a pair of Muscles arising from the *Sinus* of the inner Wing of the *Os Cuneiforme*, and going Obliquely downward, is extended into the Sides of the Gullet; it dilates the Gullet.

SPHÆNOIS. See *Os Cuneiforme*.

SPHÆNOPOTERIGOPALATINUS, See *Pterigopalatinus*.

SPHAGITIDES, according to some, are the Jugular Veins in the Neck.

SPHERE, is a Solid Body, made by the Rotation of a *Semicircle* about its Diameter.

i. All Spheres are to one another as the Cubes of their Diameters. For under the Word *Cylinder*, you will find it proved, That *Cylinders* whose Altitudes are equal to the Diameters of their Bases, are in Proportion to each other as the Cubes of their Diameters; which is thus expressed $\frac{1}{2} r d d d : r D D D :: d d d. D D D.$ wherefore, be the Ratio of a Sphere to a Cylinder of the same Diameter and Height to it, what it will, (and what it is, is shewn in another place) call it r : Therefore $\frac{1}{2} r d d d. \frac{1}{2} r D D D :: \frac{1}{2} r y d d d. \frac{1}{2} r Y D D D.$ But $\frac{1}{2} r y d d d. r Y D D D :: d d d. D D D.$ That is, Spheres are to each other as the Cubes of their Diameters. Q. E. D.

2. The solidity of a Sphere is equal to the Surface multiplied into $\frac{2}{3}$ of the Radius; as is proved from Cor. 1. of Prop. 4. in the word *Cylinder*.

3. A Sphere is equal to $\frac{2}{3}$ of a Cylinder having the Diameter of its Base and its Axis equal to that of the Sphere, i. e. a Sphere is $\frac{2}{3}$ of the Cylinder circumscribed: And the Surface of the Sphere and the curved one of the Cylinder circumscribing it, is the same in Quantity; as is proved in *Cylinder*, Prop. 4. and *Corollaries*; as also very briefly under the word *Indivisibles*.

4. The Surface of the Sphere is equal to four times the Area of a great Circle. See *Cylinder*, Prop. 4. Coroll. Wherefore add to the Curve and Surface of the Cylinder its two circular Bases, and that will make six great Circles of the Sphere: So that the Surface of the Sphere is but $\frac{2}{3}$ of the whole Surface of the Cylinder. See also *Cylinder*.

An entire Sphere of Glass will unite the Parallel Rays of any Object at the Distance of near its Semidiameter behind it. *Molyneux Dioptr.* p. 93.

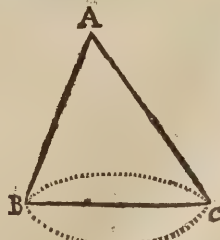
SPHERE of Activity, of any Body, is that determinate Space or Extent all round about it, to which, and no farther, the *Effluvia* continually emitted from that Body do reach, and where they operate according to their Nature. Thus we see the *Magnetical Effluvia* have certain Bounds and Limits, beyond which they will have no Influence to turn or to attract the Needle: But where-ever a Needle be placed, so as that it can be moved by a Load-stone, it may be said to be within the Sphere of Activity of the Stone.

SPHERICK Geometry, or *Projection*, is the Art of Describing on a Plane the Circles of the Sphere, or any Parts of them in their just Position and Proportion, and of Measuring their Arks and Angles when Projected.

As an Introduction to which, you must understand.

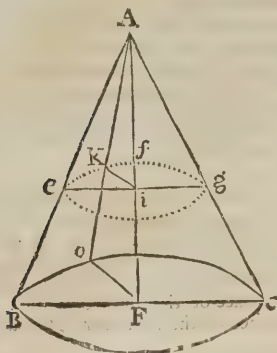
PROPOSITIONS.

- I. If a Cone, as *A B C*, be cut by a Plane, either by the Axis, or through the Vertex, the Section will be a Triangle.



For the Point A is the Vertex of the Cone, and will be so of the Triangle, and B C is a Right Line, because 'tis the Diameter of the Circle of the Base, and A B and A C must be Right Lines, because the Surface of the Cone will be described by either of them; wherefore the Section A B C is a Triangle. Q. E. D.

II. If a Cone as ABC be cut by a Plane Parallel to its Base, the Section efg will be a Circle.



For let F be the Centre of the circular Base; then will AF be the Axis; and if the Cone be cut by the Axis, the Section ABC will be a Triangle. Let eg , the Diameter of the Section, be drawn, cutting the Axis in i , wherefore eg the Diameter of the Section will be parallel to BC , the Diameter of the Base.

And consequently,

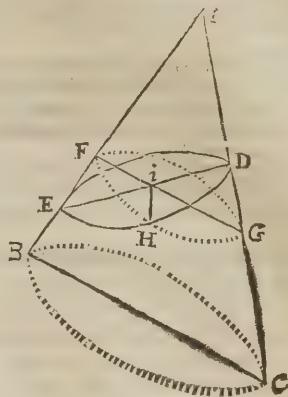
$$AF:FB::Ai:ie \text{ and} \\ \text{as } AF:FC::Ai:ig.$$

Wherefore, by *Inverse Proportion*, and *ex aequo*, as $FC:FB::ig:ie$.

But $BF = FC$, therefore $ie = ig$.

And the same consequence will arise if you take o and K , any two other Points in the Base and in the Section; for Ki being parallel to oF , and AoF being a Triangle. $AF:oF::Ai:Ki$, but as $AF:FB::Ai:ie$. Wherefore *ex aequo* $oF:FB::Ki:ie$. And therefore Ki , and ie are equal also, and consequently the Section is a Circle. For i is a Point from whence more than two Right Lines drawn to the Curve efg are equal; wherefore that Curve must be a Circle. *Q. E. D.*

III. If a Scalenous Cone ABC be cut by a Plane in a Subcontrary Position to its Base, the Section DEH will be a Circle.



1. The Section ABC made through the Axis, is a Triangle.

2. The Triangle AED is Similar to ABC ; tho' placed a contrary way, (by the Supposition) (which is called Subcontrary Position.)

3. ED being the mutual Intersection of two Planes will be a Right Line, on which take any Point, as (i) and through it draw $F-i-G$ parallel to BC , and there let the Cone be cut also, then the Plane that cuts it being parallel to the Base of the Section, FHG must be a Circle, and FG a Diameter.

Now, because both these Intersecting Planes are Right to the Plane of the Triangle ABC their common Intersection IH , will also be a Right Line, and perpendicular to the Plane of the Triangle, and to the two Lines ED and FG . And then, because the Triangles ABC , AED and AFG are all Similar, the Angles at G and E must be equal; and the Vertical ones at i being so too, the Triangle FEI must be Similar to IDG . Wherefore $DI:IG::FI:IE$, therefore $UDIE = \cap FIG$; but because FG is the Diameter of a Circle, and IH perpendicular to it, and terminated at the Circumference, 'twill be a middle Proportional between the Segments of the Diameter, and have its Square equal to the Rectangle FIG , (as also to its Equal EID) wherefore the Point H is in the Circumference of a Circle, whose Diameter is DE . *Q. E. D.*

DEFINITION I.

A Circle of the Sphere, as to its Projection on any Plane, is of four kinds.

1. The Primitive Circle, or Limb which bounds the Projection, and within which 'tis always made.

2. A Direct Circle, whose Plane is directly opposite to the Eye, or when the Eye is in the Axis of the Plane.

3. A *Right Circle*, whose Plane is coincident with the Axis of the Eye; or with the visual Rays.

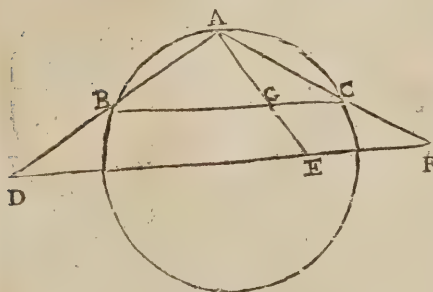
4. An *Oblique Circle*, whose Plane lies oblique to the Axis of the Eye, so that it makes unequal Angles with it.

To *Project* the Sphere truly in *Plano*, is a Part of *Perspective*; whereof there are several kinds; but the most usual is what is properly called the *Stereographick*, or *solid Projection of the Sphere*; and the *Orthographick*, or the *Analemma*: The latter of which, see in *Analemma*.

In the former, the Circles of the Globe are drawn or represented on a Plane, which passes through its Center, and hath the Eye, supposed to be in the Pole or 90° distant from it; *Projecting* the several Circles or Arks of Circles on that Plane, or on any one parallel to it.

In this *Projection*, if a Line pass through the Eye, or be coincident or parallel to the Axis; it will be represented by a Point.

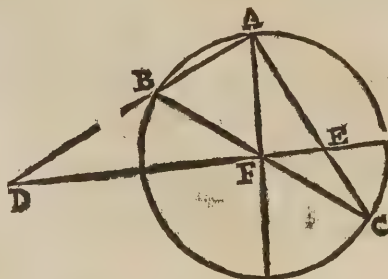
IV. If a Line be direct to the Eye, it will be projected into a *Right Line*, whose Parts will be in the same Proportion to one another, as those of the *Primitive Line*, of which it is the Representation.



For, since the Line BC (which may be the Diameter of a Parallel Circle) is supposed to lie Parallel to DF, and is projected into it from the Eye at A, if you draw the Lines AD, AE, and AF, the Triangles ABG and AEF will be Similar; as also will AGC and AEF; wherefore as AB:AD::BC:DF. and as AB:AD::AG:AE. also as AG:AE::BG:DE::GC:EF. Wherefore as the whole BC to the whole DF:: the Part BG: to the Part DE:: GC: EF.

PROP. 5.

But if a Line lie oblique to the Eye, the Parts of it in the Projection will not be in the same Proportion, as they are in the Line it self, but those Parts of it which lie nearest to the Eye, will in the Projection appear longer than those which lie more remote from it.



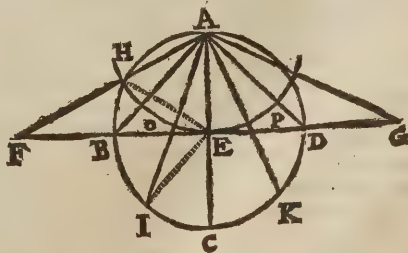
Thus, if the Eye be at A, I say the Line BC lying oblique to it, will be projected into the Line DE; and its half BF, which lies nearer to the Eye, shall be represented by the Line DF, which is longer than FE, the Representation of the other half which lies remote from the Eye; as is in a manner self evident.

If a Circle be right to the Eye, or hath its Plane coincident with, or parallel to its Axis, it will be Projected into an infinite right Line.

PROBLEM I.

Prop. 6. To represent on the Plane of the Projection a Right Circle, and to distinguish there such Parts and Divisions as shall truly correspond to those of the Right Circle given.

Let the Circle given be ABCD; and let it be divided into eight equal Parts, as in the Figure; and let the Eye be at A. Draw FG at right Angles to AC, the Axis of the Eye, to represent the Plane of the Projection; and draw also from A, AF, AB, AI, AC, AK, AD, AG, through the several Divisions of the given Circle; Then will FB, BO, OE, EP, PD, and DG, be the proper Representations of the Parts of the given Circle.



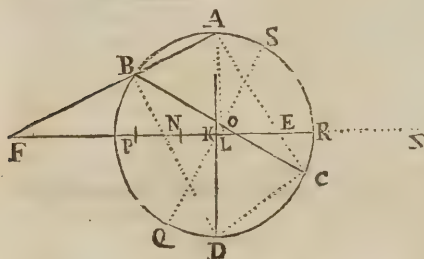
And if on A as a Center with the Distance AE, another Circle be described, 'tis plain, that OE, EB and EF, &c. will be Tangents of the Angles OAE, BAE, FAE, &c. at the Circumference,

ference, which are severally the halves of the Angles IEC , BEC , HEC , &c. at the Centre: Of which latter Angles, the Arks of the Circle given CI , CB , and CH , are the proper measures; wherefore the Right Lines OE , BE , FE , &c. are the Tangents of half those Arks; which shews us that every Diameter of a great Circle, or its Parts within or without the Primitive, is to be measured on the Scale of Half Tangents; and that the Divisions of it begin at the Centre of the Primitive Circle.

P R O P. 7.

A Circle placed oblique to the Eye at A, will be a true Circle in the Projection; but its true Centre is different from its apparent one.

Let BC be the Diameter of an oblique Circle, which is to be Projected from the Eye at A , on a Plane Represented by the Line FR , which Mr. Oughtred calls the Line of Measures.



1. 'Tis plain the Diameter BC will be represented by the Line FE . 'Tis also plain, that if right Lines were drawn from A to all the Parts of the oblique Circle, of which BC is the Diameter, they would make an oblique Cone of Rays, as ABC .

2. But I say that the Scalenoconic Cone of Rays ABC is cut by the Plane FR , *subcontrarily* to its Base, and consequently the Section will be a Circle (by the 3d) wherefore the giving oblique Circle will always be represented by a Circle on the Plane of the Projection.

That the Scalenoconic Cone ABC is cut Subcontrarily to its Base, may be thus proved.

Draw AD through the Centre of the Sphere K , and join BD and CD .

The Angle ACD is a right one, (being in a Semicircle) and the Angle AKB is right, by Supposition and Construction; and the Angle DAC is common to the two Triangles AKE and ADC ; wherefore they are Similar, and consequently the Angle ADC is equal to the Angle AEK .

But the Angle ADC is equal to the Angle ABC , as being in the same Segment; and the Angle ADC was before proved $=$ to the Angle AEK ; wherefore the Angle $ABC =$ Angle AEK ; and since the Angle ABC is common to both, therefore the Angle F must be equal to the Angle C , and consequently the Cone ABC is cut *subcontrarily*, and therefore FE is the Diameter of a true Circle, whose real Centre will be in P the middle Point; but the apparent Centre of the Circle will be at L ,

where the Point O (which is the middle Point of BC) is projected.

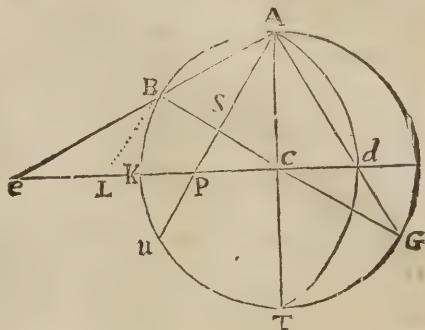
There are several other ways of finding P the Centre of the Projected Circle; but this is as expeditious as any.

To Project the Poles of the oblique Circle BC , draw through K the Centre of the Sphere, a right Line as QS , perpendicular to BC , which therefore will be the Axis of the oblique Circle: Then a Ruler laid from A through Q and S , the Pole of that Axis shall Project the Polar Points in N and Z .

P R O P. VIII.

The Center (P) of every great Circle (BG) which lies oblique to the Primitive (in the Projection) is so far distant from C, the Centre of the Primitive, as is the Tangent of the Ark of Elevation of its Plane, above the Plane of the Primitive.

Make the Ark $Bu = GT$, the Complement of the Angle of Elevation, and draw uA , which will find the Point P , the Centre of the Projected Circle.



D E M O N S T R A T I O N.

Because the Angle $BAu =$ Angle CAG as being on equal Arches) and the Angles ABG equal to the Angles Ade , (by the Subcontrary Position) therefore the Triangles BAu and Ade are Similar, and consequently the Angle BSA (which is equal to the Angle $A'cd$) is a right one.

Draw BL perpendicular to BC , wherefore, the Triangles BLC and APC are Similar; for Angle $BLC =$ Angle PCA , as being both right ones; and the Angle $APC = BLC$, because BL and AP , are Parallels; wherefore the Angle $BCL =$ Angle PAC .

But PC is the Tangent of the Angle PAC , and therefore of its equal the Angle BCL , or of the Ark BK , which is equal to the oblique Circle's Elevation above the Plane of ed ; wherefore P the Centre of the oblique Circle is distant from C by the Tangent of its Elevation above the Plane ed . $Q.E.D.$

C O R O L.

Also, because the Triangles ePA and ACG are Similar, (as having Angle $e =$ Angle G , by Subcontrary Position) and the Angle $BAP =$ Angle CAG (as being on equal Arks) therefore will $eP : P$

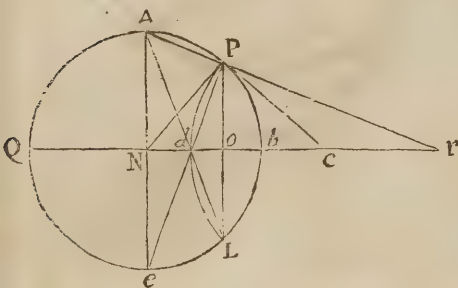
$e P : P A :: A C : C G$, that is, $e P = P A$. But $P A$ is the Secant of the Angle $P A C$, or of the Ark $B K$; wherefore the Secant of the Elevation $e P$ fet from e , shall find P the Centre as before; $P e$, $P A$, or $P d$ being its Radius.

PROP. IX.

Problem. 2.

To project a Lesser, or Parallel Circle PL , whose Poles are in the Line of Measures Q, r ; representing the Plane of the Projection.

First, *Project* the Diameter of the Lesser Circle PL, into that of the *Projection* in the Points *d* and *r*, and draw a Line from P to N; to which erect PC at Right Angles; so shall C be the true Centre of the projected Circle.



DEMONSTRATION.

The Angle NAP , is equal to the Angle $\text{OP}\tau$, because A N is parallel to P O : Also the Angle e A P , is equal to the alternate Angle e P L : But the Angle e A P , added to the Angle e , is equal to a Right one. Wherefore the Angle $\text{OP}\tau + \text{P}\tau\text{O}$, = a Right Angle: That is, The Angle $\text{d P}\tau$, is a Right Angle. Wherefore $\text{d}\tau$, is the Diameter of a Circle.

Now NPC , being right by Construction, take from those two right Angles, the common one dPC , and the Angle $NPd (= \angle e)$ must remain equal to the Angle CPr , and the Angle r , is = to the Angle e , because the Triangles Nde , and Pdr , are similar: Wherefore the Triangles PCr , and NPe , are similar; and consequently, $eN : NP :: PC : Cr$ but $eN = NP$; therefore $PC = Cr$. Therefore both are Radii of a Circle. $Q. E. D.$

And to prove $P C \doteq d C$, and consequently that they also are Radii.

I say, The Triangle $d P C$, is an Iſoſceles, be-
 cause the Angle $P d C$, is equal to the Angle $d P C$;
 which I thus prove.

The Angle $P d o + \angle d P o = \text{Right Angle}$,
 $= \angle d P C + \angle C P r$, but $C P r = \angle e = d P o$:
 Therefore taking away the common Angle $d P o$,
 (or its equal $C P r$) $d P C$ must remain equal to
 $P d C$: wherefore $P C (= C r) = C d$. Where-
 fore c is the true Centre of the projected Circle.

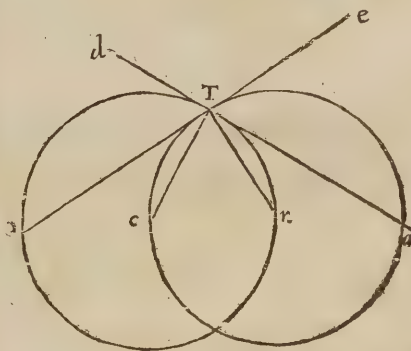
COROLLARY I.

1. Hence 'tis plain, That making NP the Radius of a Circle, whose Centre is N , the projected Circles Centre C , is distant from N , the Centre of the Primitive, by NC ; the Secant of the Ark Pb , or of that lesser Circle's Distance from its Pole b .

2. The Semi-diameter of this projected Circle (C d) is equal to (C P) which is the Tangent of the laid Ark P b, or of that Circle's Distance from its Pole.

PROP. X.

The Angle of the Intersection of any two Circles on a Plain, is equal to the Angle made by their Radii drawn from their Centres to the Point of Intersection.



I say, The Rectilineal Angle $\sigma T n$, made by the two Radii σT , and $T n$, is equal to the Curvilineal Angle $\sigma T c$, made by the Arks σT , and σT ; which is equal also to the Curvilineal Angle $n T a$, made by the Arks $n T$, and $T a$.

Draw oT , and Ta , Tangents to the Intersecting Circles.

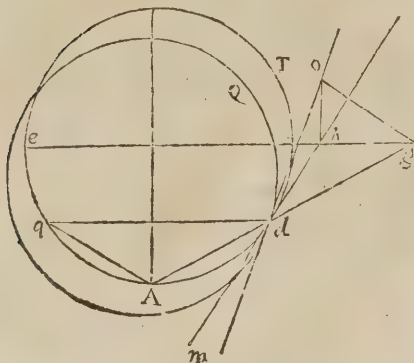
Then the Angles of Contact $\angle T \hat{c}$, and $\angle n \hat{t} a$, which are made by the Tangents and the Curves, being less than any acute ones, and indeed no Quantity; the Tangent $\angle t \hat{e}$, and $\angle d \hat{t} a$ will fall in with the Circles, and make the same Angles with one another, as the Arks of those Circles do: Wherefore the Curvilinear Angle $\angle o \hat{t} c$, is equal to the Rectilinear one $\angle o \hat{t} d$; and on the other side, the Curvilinear Angle $\angle n \hat{t} a$, is equal to the Rectilinear one $\angle a \hat{t} e$.

Wherefore since the Right-lin'd Angles $d T c$, and $o T n$, are both Right Angles, and equal: If you take away the common Angle $o T c$, the Angle $d T o$, must be equal to the Angle $c T n$; and consequently the Angle $e T n$, is equal to the Angle of Intersection $o T c$. Q. E. D.

PROP. XI.

PROP. XI.

All Angles made by Circles on the Superficies of the Sphere, are equal to those made by their Representatives on the Plane of the Projection.



Let there be two Circles, Q and T, intersecting each other at d.

I say, the Angle Q d T, made by the Planes of these Circles, is equal to the Angle o g h, made by their Tangents o d, and d h, when projected.

Let the Eye be at A, and the point of Intersection d; then draw d h, a Tangent to the outer Circle d T, and d o, a Tangent to the Inner Circle d Q.

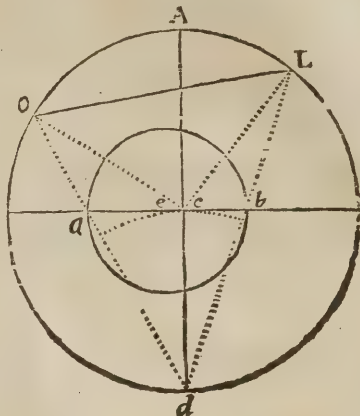
Thence since the Plane of the Projection e g, as also that made by the Tangents d h, and d o, (which are in the same Plane) are both perpendicular to the Plane of the Circle e T d A; their common Intersection o h, must be a Right Line, and also perpendicular to e g.

Draw all the Lines, as in the Figure; then will the Angle A d m, (made by the Tangent and Secant) be equal to the Angle g, (in the opposite Segment) which is equal to q d A, because the Triangle q A d, is an *Isosceles*; but the Angle q d A = \angle h g d, because q d is parallel to e g: Therefore the Angle h g d = \angle A d m = Vertical Angle b g d: Wherefore the Triangle b d g, is an *Isosceles*, and consequently d b = b g.

Hence the Triangle o d h, hath two Sides, o h, and h d, and the Right Angle o b d, equal to two Sides, and one Angle, in the Triangle o h g: Wherefore all things are equal, and consequently the Angle o g h, is equal to the Angle o d h, equal to the Curvilinear Angle Q d T. Q. E. D.

PROP. XII.

To Project a lesser Circle, when its Poles are not in the Plane of the Projection.



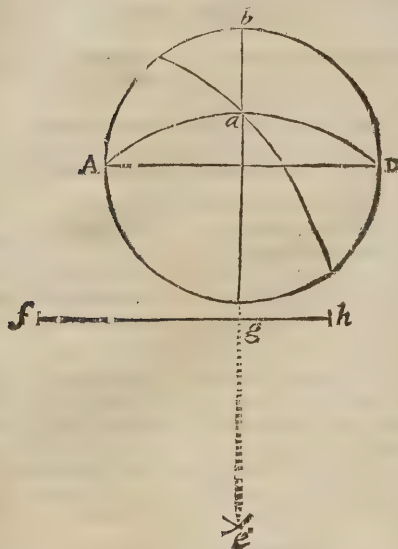
Let O L be the Diameter of such a Circle, a Ruler from the Point d, where the Eye is supposed to be placed, to O, will Project the Point a; and from d to L, will project the Point b: Therefore a b is the projected Diameter, and consequently its middle Point e, will be the Centre of that Circle in the Projection.

The Demonstration you have universally in Prop. 4.

Or, since by (Prob. 1.) C a, and C b, will be the half Tangents of the Arks A O, and A L, (for the Primitive Circle is right to the Eye at d:) Therefore to project such a lesser Oblique Circle, you need only take the half Tangents of the Distance of each end of the Diameter of such a lesser Circle from the Point A, opposite to the Eye supposed at d; and set them from the Centre C, and they will find the Points a and b, the ends of the projected Diameter; and a b bisected, will give the Centre e.

P R O P. XIII.

All Great Circles of the Sphere, passing through any Point *a*, in the Diameter of the Projection, shall have their Centres in the Line *g f*, which is perpendicular to the Diameter *g b*, and their Centers will be distant from the Point *g*, the Centre of the Circle *A a D*, by the Tangent of the Angle of their Intersection with the said Circle *A a d*.



It is plain from what hath been proved in Proposition 10, that the Angle of the Radii of any two Circles is equal to the Angle of the Intersection of their Peripheries: And therefore if it were required to draw a great Circle thro' the Point *a*, which shall make any given Angle with the Circle *A a d*.

Set the Tangent of that Angle, from *g* the Center of the Circle *A a D*, found by the making a Circle pass thro' the three Points *A*, *a*, and *D*, and that shall find the Point *f*, the Centre of the Circle required

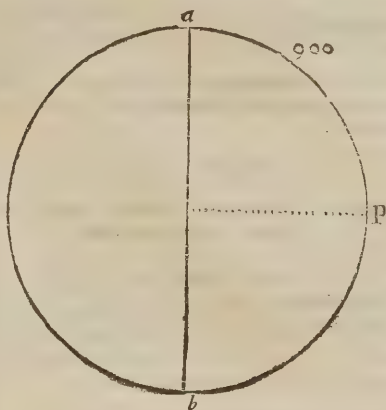
C O R O L L A R Y.

Hence if *a* be supposed to be the Polar Point of the World projected, and it were required thro' it, to project all the Hour Circles; *A a D*, will be the Hour Circle of six, whose Center is in *g*; and by setting the Tangents of 15, 30, 45, 60, &c. both ways from *g* towards *f* and *b*, (agreeable to the Radius *ag*) all the other Hour Circles may be described on the Plane of the Projection; from their Centers in the Line *f h*.

Which is the Foundation of all Dyalling, or the True Projection of the Hour Circles of the Sphere on any given Plane:

P R O P. XIV.

Problem 3. To find the Pole of any Great Circle.



If the Pole of the Primitive Circle be required 'tis its Centre,

If the Pole of a Right or Perpendicular Circle be sought, 'tis 90 Degrees distant, reckoned upon the Limb from the Points, where this Circle (which is a Diameter) cuts it.

As *P* is Pole of the Perpendicular Circle *a b*.

If the Pole of an Oblique Circle be described, which in the Projection will be an Ark of a great Circle.

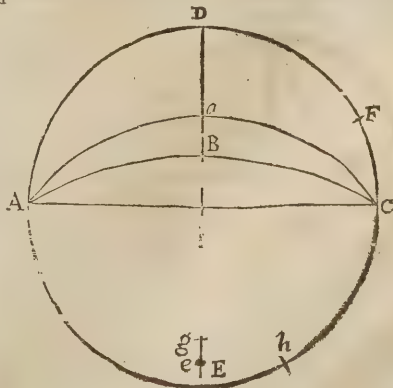
1. Consider that this Circle must cut the Primitive in two Points, that will be distant from each other just a Diameter, as is the Case of the Intersection of all great Circles.

2. The Pole of this Circle must be in a Line Perpendicular to its Plane. And,

3. This Circle Poles cannot but lie between the Centre of the Primitive one, and its own,

For Instance.

Let the Poles of the Oblique Circle *A B C*, be required.



T. Draw

1. Draw the Diameter A C, and then another as D E, Perpendicular to it.
2. Lay a Ruler from A to B, it will cut the Limb in F; then take the Cord of 90 Degrees, and set it from F to h.

3. Lay a Ruler from h to A, it will cut D E in g; which Point g is the Pole required.

N. B. The finding the Points f and h, is called reducing B to the *Primitive Circle*, and to the *Diameter*.

PROP. XV.

Problem 4. To describe a Spherical Angle of any Number of Degrees given.

1. If the Angular Point be at the Center of the *Primitive Circle*, then 'tis made at any Plane Angle, numbring the Degrees in the Limb, from the Line of Cords: For all Circles passing thro' the Centre, and which are at Right Angles with the Limb, must be projected into Right Lines.

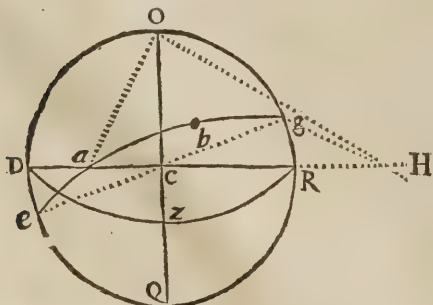
2. If the Angular Point be at the Periphery of the *Primitive Circle*; draw a Diameter as A C; (see the last Figure :) Then take the secant of the Angle given in your compasses, (as suppose 65 Degrees) and setting one Foot in A, cross the Diameter in e, or if no Diameter be drawn, placing one Foot in C, and crossing the former Ark, you will find the same Point e, which is the Center of the Circle A a C, which with the *Primitive* makes an Angle D A a of 65 Degrees.

N. B. If the Angle given be obtuse, take the secant of its Supplement to 180 Degrees.

3. If a Point as a were assigned, thro' which the Ark of the Circle constituting the Angle must pass; draw the Diameter A C (as before :) Then take the secant of the given Angle, and setting one Foot in A or C, strike an Ark as at e, and then with the secant of the given Angle, setting one Foot in a, cross the other Ark in e, which will be the Centre of the *Oblique Circle* required.

PROP. XVI.

Problem 5. To draw a great Circle thro' any two Points given, as a and b within the *Primitive* one.



Draw a Diameter thro' that Point which is furthest from the Center, as D R, producing it beyond the Limb if there be occasion; set 90 Degrees from D or R to O, and draw O a.

Then erect O H, Perpendicularly to a O, and produce it till it cuts the Diameter prolonged in H; that Intersection H is a third Point, thro' which as also this a and b, if a Circle be drawn, it will be a great Circle, as e a b g.

Which is easily proved, by drawing the Line e C g; for that Line is a Diameter: Because its Parts multiplied into one another, are equal to $a c + c H = O C g$, by 35. d 3, and Cor. 8 d 6, Euclid.

PROP. XVII.

Problem 6. To draw a great Circle Perpendicular to, or at Right Angles with another.

Let it pass thro' its Poles, and 'tis done.

Of which there will be four Cases.

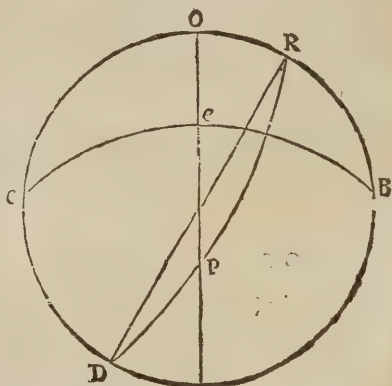
1. To draw a Circle Perpendicular to the *Primitive*; which is done by any straight Line passing thro' the Centre.

2. To draw a Circle Perpendicular to a Right Circle; is only to draw a Circle at Right Angles with that Right Circle.

3. To draw an Oblique Circle Perpendicular to a Right one; only draw a Circle which shall pass thro' both the Poles of such a Right Circle, and 'tis done.

Thus the Oblique Circle D z R, is Perpendicular to the Right one O Q, because it passes thro' its Poles D and R. See the last Figure.

4. To draw one Oblique Circle Perpendicular to another.



Find First P the Pole of the given Oblique Circle C e B, and then draw any how the Diameter D R, so a Circle drawn thro' the Three Points; D P and R shall be the Circle required; for passing thro' the Poles of the Oblique Circle C e B, it must be Perpendicular to it.

PROP. XVIII.

P R O P. XVIII.

Problem 7. *To measure the Quantity of the Degrees of any Arch of a great Circle.*

1. If the Arch be part of the Primitive, 'tis measured on the Line of Chords.

2. If the Arch be any Part of a Right Circle, the Degrees of it are measured on the Scale of half Tangents, supposing the Centre of the Primitive Circle to be in the beginning of the Scale, so that if the Degrees are to be reckoned from the Center, you must account according to the order of the Scale of half Tangents.

But if the Degrees are to be accounted from the Periphery of the Primitive, as will often happen, then you must begin to account from the end of the Scale of half Tangents calling 80, 10, 70, 20, &c.

3. To measure any Part of an Oblique Circle; first find its Pole, and there laying the Ruler, Reduce the two Extremities of the Ark required to the Primitive Circle, and then measure the Distance between those Points on the Chords.

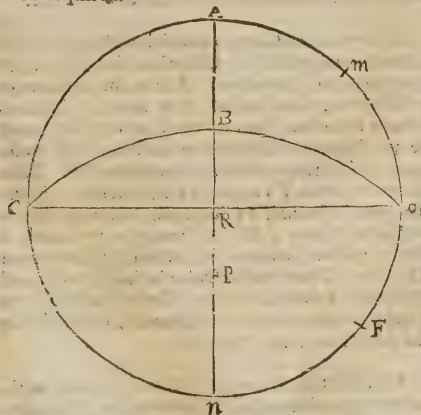
Thus in the last Figure, if the Quantity of $e B$ an Arch of the Oblique Circle $C e B$ were required; lay a Ruler to P the Pole, and reduce the Points e and B , to the Primitive Circle, so shall the Distance between e and B , measured on the Chords, be the Quantity of Degrees in the Ark $e B$.

P R O P. XIX.

Problem 8. *To measure any Spherical Angle.*

1. If the Angular Point be at the Centre of the Primitive, then the Distance between the Legs taken from the Limb, and measured on the Chords, is the Quantity of the Angle.

2. If the Angular Point be at the Periphery of the Primitive Circle, as suppose the Angle $A C B$ were required.



Here the Poles of both Circles being in the same Diameter; find the Pole of the Oblique Circle $C B O$, which let be $B P$. Then the Distance $R P$,

measured on the Scale of half Tangents, is the measure of the Angle $A C B$.

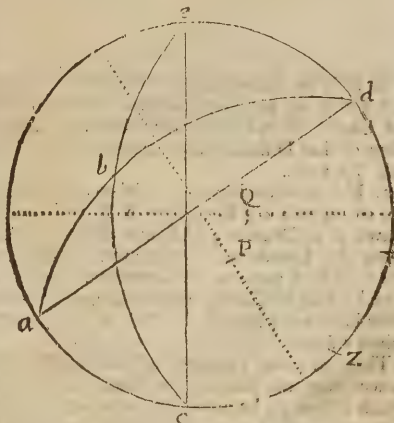
For the Poles of all Circles, must be as far distant from each other, as is the Angle of the Inclination of their Planes.

But if the two Poles are not in the same Diameter, being both found in their proper Diameters, reduce those Points to the Primitive Circle, and then the Distance between them there, accounted on the Chords, is the Quantity of the Angle sought.

Thus, if the Angle $B C R$ be sought.

A Ruler laid to the Angular Point C , and P the Pole of the Oblique Circle $C B O$, will find on the Limb of the Point F , and being laid from the same Angular Point thro' n , the Pole of the Right Circle $C R O$, will give the Point n in the Limb, wherefore the Ark $F n$ measured on the Chords, is the measure of the Angle $B C R$.

3. When the Angular Point is some where within the Primitive Circle, and yet not at the Center, proceed thus.

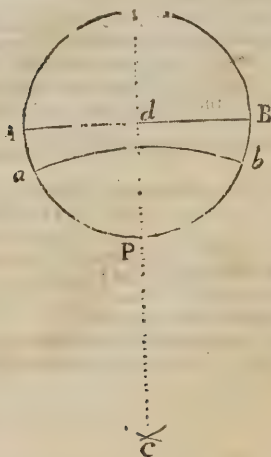


Suppose the Angle $a b c$ be sought.

Find the Pole P of the Circle $a b d$, and then the Pole of the Circle $c b c$: After which lay a Ruler to the Angular Point; and the two Poles P and Q , and reduce them to the Primitive Circle, by the Points x and z ; so is the Ark $x z$ measured on the Chords, the Measure of the Angle $a b c$ required, and $C b d$ is its Complement to 180 Degrees.

P R O P. XX.

Problem 9. To draw a Parallel Circle.

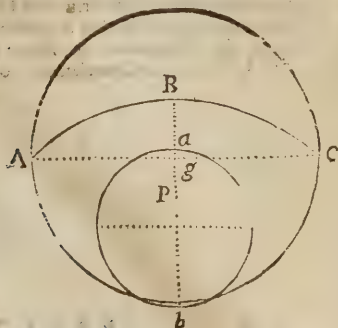


1. If it be to be drawn Parallel to the Primitive Circle at any given Distance, draw it from the Centre of the Primitive, with the Complement of that Distance taken from the Scale of the half Tangents.

2. If it be to be drawn Parallel to a Right Circle, as suppose ab Parallel to AB , were to be drawn at 23 Degrees 30 Minutes distant from it; From the Chords take 23 Degrees 30 Minutes, and set it both ways on the Limb from A to a , and B to b (or set its Complement 66 Degrees, 30 Minutes both ways from P the Pole of AB) to the Points a and b .

Then take the Tangents of the Parallels Distance from the Pole of the Right Circle AB , which is here 66 Degrees, 30 Minutes, and setting one Foot in a and b , with the other strike two little Arches to Intersect each other some where above P , which will give C the Centre of the Parallel Circle abd required.

3. If it be to be drawn Parallel to an Oblique Circle, and at the Distance suppose of 40 Degrees.



First, find P the Pole of the Oblique Circle ABC , and then measure on the Scale of half Tangents the Distance gP , which suppose to be 34 Degrees.

grees, then add to it 50 Degrees the Complement of the Circles Distance, it will make 84 Degrees, and also subtracting 50 from it, or it from 50, it will make 16 Degrees: Then this Sum and Difference taken from the half Tangents, and set each way from P the Pole of the Oblique Circle, will give the Diameters two extremes a and b , or the Points of the Intersection of the Parallel, and then the middle Distance between a and b , is the Centre of the true Parallel Circle Pab , which is Parallel to the given Oblique Circle ABC , and at the given Distance of 40 Degrees; or the half Tangent of 84 set from g , will give b , and the half Tangent of 16 Degrees set also from g , will give the Point a , the two ends of the Parallel Circles Diameter.

P R O P. XXI.

Problem 10. To measure any Projected Arch of a Parallel Circle.

Here will be three Varieties.

1. If it be Parallel to the Primitive, then a Ruler laid thro' the Centre and the Division of the Limb, will divide the Parallel into the same Degrees, or determine in the Limb the Quantity of any Ark Parallel to it.

2. If the Circle be Parallel to a Right one, as abd is, in Case the second of the last Proposition, and it were required to measure that Ark ab , or to divide it into proper Degrees: Since that Parallel Circle is 66 Degrees, 30 Minutes distant from P , the nearer Pole of the Right Circle AB , and consequently 113 Degrees, 30 Minutes distant from its other Pole, take the half Tangent of 113 Degrees, 30 Minutes, or the Tangent of its half 56 Degrees, 45 Minutes, and with that Distance, and on the Centre of the Primitive, draw a Circle Parallel to the Limb; and divide that half of it, which lies towards the opposite Pole of AB into its Degrees, which is easily done by a Sector: Then a Ruler laid from P , and the equal Divisions of that Semicircle, shall divide ab , or measure any Part of it.

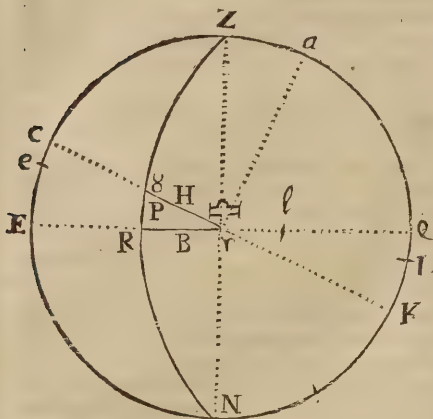
3. To measure or divide the Ark of a Circle which is projected Parallel to an Oblique one.

As suppose the Circle abd which is Parallel to the Oblique one ABC , in Case the third (Fig. 2.) of the preceding Proposition: And at the Distance of 40 Degrees; this Parallel Circle being 40 Degrees distant from the Plain of the Circle ABC must be 50 Degrees distant from its Pole, and consequently 130 Degrees from the opposite Pole. Take therefore the half Tangent of 130 Degrees, or the Tangent of its half 65 Degrees, and with that as a Radius, draw a Circle Parallel to the Limb of the Primitive; which Circle divide it into proper Degrees: Then shall a Ruler be laid thro' P , and the equal Division of that Circle, cut the little Circle abd into its proper Degrees; or truly give the Measure of any part of it.

SPHERICK Triangle, is a Space included within the Arks of three great Circles of the Sphere, intersecting each other on the Surface of the Globe, and every such Triangle is either *Quadrantal*, which hath on one Side (at least a Quadrant and one Angle Right); or *Ordinary Quadrantal*, which hath all

its Sides more or less than 90 Degrees; and all its Angles bigger or lesser than Right ones.

The Application of Spherick Geometry, to the Construction and Mensuration of all the Parts of Spherick Triangles.



In the Right-angled Spherick Triangle ∇ R ∇ .

H = 54 Degrees, 15 Minutes, the Sun's Longitude from the next Equinoctial Point, or 24 Degrees, 15 Minutes of φ .

B = 51 Degrees, 52 Minutes, the Sun's Right Ascension.

P = 18 Degrees, 15 Minutes, the Sun's Declination.

φ = the Angle of the Sun's Position.

∇ , \simeq , the Angle of the Sun's greatest Declination.

To make the Triangle.

With 60 Degrees of a Line of Chords, describe the Circle Z C K Q, which is the Limb, or Primitive Circle, and here represents the foliocal Colure. Draw the Diameter E Q, which will be the Equator g here represented by a Right Line, because the Eye is at ∇ or \simeq , in its Plane. Take 23 Degrees, 30 Minutes from the same Chord, and set it from E to C, so shall CK be the Ecliptick, which will be a Right Line, also for the same Reason. Then either the Sun's Place set from ∇ on the Ecliptick, or his Right Ascension set from thence on the Equator, will give the Point φ , or R, accordingly. Then draw Z N at Right Angles to the Equator, and so you will have three Points Z φ N, or Z R N, thro' which the Circle of Declination Z φ R N, may be easily drawn.

To measure the Sides and Angles.

The Sides H and B being straight Lines, are measured on the Scale of half Tangents, by Prop. 6. of Spherick Geometry; and the Side P is measured by finding l , the Pole of the Oblique Circle Z φ H; and from thence laying a Ruler to the two Extremities of the Side P, (*i. e.*) thro' φ and R, in or-

der to reduce them to the Limb in E and e ; the Ark E e , measured on the same Line of Chords, will give the Quantity of the Side φ R = 18 Degrees, 15 Minutes.

And this is the general Rule to measure the Arks of all Oblique Circles, Prop. 18. Case 3.

For the Angles.

That at R, is a Right one, and so known.

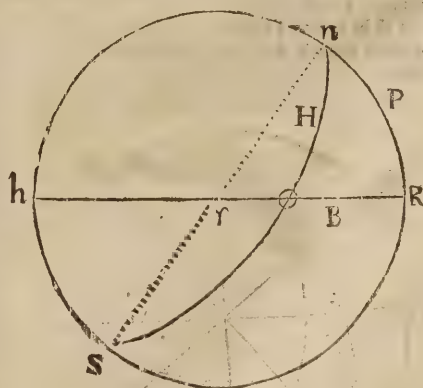
That at ∇ , is the Angle of the Sun's greatest Declination = 23 Degrees, 30 Minutes, and its Measure is the Ark B C of the Limb, by Prop. 19. Numb. 1.

The Angle of the Sun's Position φ , is measured by laying a Ruler thro' φ , the Angular Point, and thro' a and l , the Poles of the Circles C ∇ K, and N ∇ Z, which will find the Points a and l in the Limb, and the Ark a L = 72 Degrees, is the Measure of the Angle φ required, by Prop. 19. Numb. 3.

You may consider also, the Triangle Z C φ , where one Angle is at the Periphery of the Primitive Circle, and this will help to shew the Varieties of Right-angled Spherick Triangles.

Here the Angle C is a Right one, being made by an Hour Circle, or the Meridians cutting the Equator; for here C K may represent the Equator, and let Z be the Zenith of any Place, then will C φ be the Hour from Noon; C Z will be the Latitude of the Place, and φ Z, the Complement of the Sun's Height, being now supposed to be in the Equator. The Angle Z will be the Sun's Azimuth from the South, the Oblique Circle Z φ R N, being a Vertical one; and the Angle φ , will be the Angle of the Sun's Position. Which Triangle C φ Z may be formed, and all its Sides and Angles measured by the Propositions and Rules above delivered.

Again,



In the Right-angled Spherick Triangle N C R. R = Right Angle made between the Horizon H R and the Meridian n R.

B = Complement of the \odot 's Amplitude = 50 Degrees 8 Minutes.

H = to the Sun's Distance from the Pole above the Horizon h R; or the Complement of his Declination.

P = to the Elevation of the Pole, or Latitude of the Place.

⊙ = the Angle of the Sun's Position.

⊙ n R = the Hour from Midnight.

To describe this Triangle.

First, Draw the Circle $b n R$, representing the Meridian, and then the Diameter $b R$, for the Horizon of London: Set the Poles height 51 Degrees, 30 Minutes from R to n the North Pole, and draw the Oblique Axis, $n \gamma S$. Then if the Sun's Amplitude be given, set that, Suppose 39 Degrees 52 Minutes, from γ to \odot , which will limit the Base B , and give a Point thro' which and the two other given Points n and S , a great Circle may be drawn, which will form the Triangle. But if instead of that, the Angle $\odot n R$, or the Time from Midnight had been given, then you must turn that Time into Degrees, and by *Prop. 15. Case 2.* make a Spherick Angle with the Limb, of that Number of Degrees, at the Point n , and that will determine the Point \odot .

The Angle $\odot n R$, is measured by *Prop. 19. Case 2.*

Thus also in Oblique angled Spherick Triangles, all the Sides and Angles may (by this Method) be measured, and the Triangles constructed.

In the following Obtuse-angled Spherick Triangle $\odot Z N$.

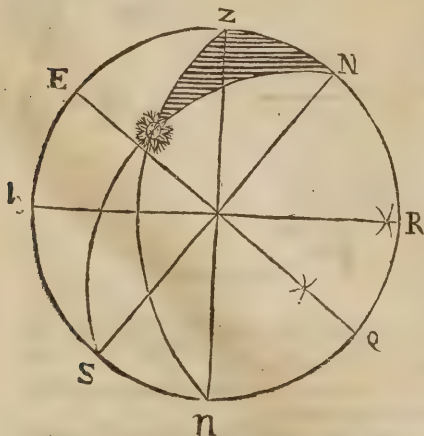
$Z N$ = to the Complement of the Poles Elevation, = 38 Degrees, 30 Minutes.

⊙ N = the Complement of the Sun's Declination from the Equator $E Q$.

⊙ Z = 46 Degrees, 49 Minutes = the Complement of the Sun's Altitude above the Horizon $b R$.

⊙ $N Z$ = 30 Degrees, is the Hour from Noon or Ten a Clock in the Morning.

⊙ $Z N$ = 137 Degrees, 47 Minutes is the Sun's Azimuth from $Z R n$, the North part of the Meridian.



To Construct the Triangle.

1. With 60 Degrees of a Line of Chords, draw the Primitive Circle $Z R n b$; which crosses in the Centre with two Diameters, $b R$ representing the Horizon of London, and $Z N$, the Prime Vertical Circle.

2. Set the Elevation of the Pole = 51 Degrees, 30 Minutes, from R to N ; so is N the North Pole of the World: And drawing $N S$ thro' the Centre, it will be the Axis, and S the South Pole.

3. Cross $N S$ with another Diameter at Right Angles, and that will be $E Q$, the Equinoctial.

4. Then because the Time from Noon is 2 Hours, or 30 Degrees, and that all Hour Circles pass thro' the Poles, and make Angles with the Meridian; make an Angle at N , of 30 Degrees, by *Prop. 15. Case 2.* which will be the Spherick Angle $E N \odot$.

5. And since the Azimuth is 137 Degrees 47 Minutes, from the North, subtract that out of 180, and there will remain 42 Degrees, 13 Minutes, the Sun's Azimuth from the South; and because all Azimuths, or Vertical Circles, pass thro' Z the Zenith; make an Angle with the Primitive at Z , of 42 Degrees, 13 Minutes, (by *Prop. 19. Case 2.*) and so will your Triangle be Stereographically projected, and the Reason of the Thing made plain and easie.

I don't give Instances of the *Analemma*, or of the several Stereographick Projections on the Plains of the Horizon, Equator, Meridian, &c. because you will find them in their proper Places under those Words.

SPHERICAL Numbers. See *Circular Numbers*.

SPHEROID, is a solid Figure made by the Rotation of a *Semi-Ellipsis* about its Axis; and is always equal to $\frac{2}{3}$ of its circumscribing Cylinder, *Archim. de Conoid. & Spheroid. 18. & 25. 2.*

SPHINCTER, is a Muscle that contracts the Gullet, *Anus*, Bladder, &c.

SPHINCTER Ani, is a large, thick, fleshy Muscle encompassing the *Anus*: Its Figure and Series of Fibres externally, immediately under the Skin, incline to an oblong Oval: It is connected forward, to the *Accelerator Urine*; backwards, to the *Os Coccygis*; its Fibres are Circular for near two Inches in breadth; it is much larger in Men than in other Animals, in whom by reason of the erect Position of the Body, there is greater Force required to retain the *Feces*, which is the Office of this Muscle.

SPHINCTER Gulae. See *Oesophagus Gulae*.

SPHINCTER Vaginae, is a Muscle lying immediately under the *Clitoris*, encompassing the *Vagina* with Circular Fibres 3 Fingers in Breadth: In some Subjects (saith Mr. Cowper) it scarce appeareth fleshy. When this Muscle acts, it not only straitens the *Vagina*, but thereby it also hinders the Blood in its return from the *Plexus retiformis* of the *Pudendum*, by compressing some of its Veins that pass underneath, by which means the *Labia* become distended, and the *Vagina* contracted.

SPHINCTER Vesicae, is a Muscle seated in the upper part of the Neck of the Bladder, immediately

ately above the *Glandula Prostate*; whose Contraction hinders the Involuntary Egrels of the Urine.

SPHYGMICA, is that Part of Physick which treats of Pulses. *Blanchard*.

SPIKES, or as the Seamen call them *Speeks*, are large long Iron Nails with flat Heads; they are of divers Lengths, some a Foot or two long, and some are jagged, so that they cannot be drawn out again. They are used to fasten the Planks and Timbers. They call also a kind of small *Fidd*, which serves them to open and splice small Ropes, a *Marling Spike*.

SPIKING up the Ordnance, is fastning a *Coin*, or *Quoin* with Spikes to the Deck, close to the Breech of the Carriages of the Great Guns, that they may keep close and firm to the Ship-sides and not break loose when the Ship *Rolls*, and by that means endanger the breaking out of the *Butt-head* of a Plank.

SPINA Dorsi, are the hinder Prominences of the *Vertebrae*.

SPINA Ventosa, is an Ulceration, in which the Bones are eaten by a malignant Humour without any Pain of the *Periosteum*, or Membrane that covers the Bone: After that, a Swelling being risen without any Pain, the Part affected is quite eaten out with the Ulcer, from whence frequently follows a Necessity of Amputation.

SPINALIS Colli, is a Muscle so called, because it accompanies the Spines of the Neck; it arises from the five superior Transverse Processes of the *Vertebrae* of the *Thorax*, and inferior of the Neck, and in its Ascent becomes more fleshy, and is so inserted largely into the inferior Part of the *Vertebrae* of the Neck laterally, &c. These draw the *Vertebrae* of the Neck directly backwards.

SPINALIS Medulla. See *Medulla Spinalis*.

SPINDLE, is the smallest Part of a Ship's Capstan which is betwixt the two Decks. The *Spindle* of the *Jeer Capstan* hath *Whelps* to heave the *Viol*. Also the Axis of the Wheel of a Watch or Clock is called the *Spindle*, and its Ends the *Peavets*.

SPINE, the Back-Bone, or long jointed Chinese Bone that goes down the Back.

SPINSTER, a Term in Law, being an Addition usually given to all unmarried Women, from the Viscount's Daughter downward.

SPIRAL-Line, in Geometry, is according to *Archimedes* thus generated.

If a Right Line as A B, having one end fix'd at B, be equally moved round, so as with the other end B, to describe the Periphery of a Circle; and at the same time a Point be conceived to move forward equally from B towards A in the right Line B A, so as that the Point describes that Line, while the Line generates the Circle. Then will the Point with its two Motions describe the curve Line B, 1, 2, 3, 4, 5, &c.



which is called a *Helix* or *Spiral Line*; and the plane Space contained between the Spiral Line and the Right Line B A, is called the *Spiral Space*.

If also you conceive the Point B to move twice as slow as the Line A B, so as that it shall get but half way along B A when that Line shall have formed the Circle; and if then you imagine a new Revolution to be made of the Line carrying the Point, so that they shall end their Motion at last together; there will be formed a *Double Spiral Line*; and two Spiral Spaces as you see in the Figure. From the Genesis of which may easily be drawn these Corollaries.

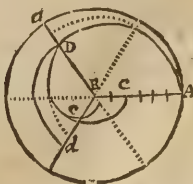
1. That the Lines B 12, B 11, B 10, &c. making equal Angles with the first and second Spiral, (as also B 12, B 10, B 8, &c.) are in Arithmetical Proportion.

2. The Lines B 7, B 10, &c. drawn any how to the first Spiral, are to one another as the Arks of the Circle intercepted betwixt B A and those Lines. Because whatever Parts of the Circumference the Point A describes; as suppose 7, the Point B will also have run over 7 Parts of the Line A B.

3. Any Lines drawn from B to the second Spiral, as B 18, B 22, &c. are to each other, as the aforesaid Arks, together with the whole Periphery added on both sides: For at the same time that the Point A runs over 12, or the whole Periphery, and perhaps 7 Parts more, shall that Point B have run over 12 and 7 Parts of the Line A B, which is now supposed to be divided into 24 equal Parts.

PROPOSITIONS.

I. The first Spiral Space A D C B is to the first Circle :: as 1 to 3.



Divide the Circumference of the Circle into 3 = Parts by Lines drawn from the Center B, beginning from the first Line B A; then will (by Cor. 1.) B c be = 1, B D = 2, and B A = 3; and the Sectors circumscribed about the Spiral will be as the Squares of the Radii, viz. C B c = 1, D B d = 4,

$DBd = 4$, and $ABa = 9$; and so it will be always, if you make never so many Bisections of the 3 first Divisions of the Circle. That is, the Lines drawn from B to the *Spiral*, will be as 1, 2, 3, 4, 5, 6, &c. and the Sectors circumscribed, as 1, 4, 25, 36, &c. always going on in the order of Squares, or in a duplicate Ratio. But a Rank of such Terms, are to a Rank of as many, equal to the greatest, as 1 to 3 (by N. 7. of *Arithm. Progression*.) Wherefore the whole *Spiral Space* (which is composed of such Sectors) is to the whole Circle :: as 1 to 3. Q. E. D.

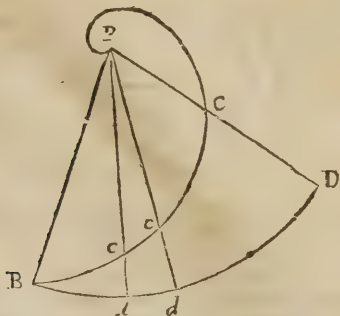
(Or,)

If another Circle be drawn with a Radius double to the former, its Area will be (as the Square of its Diameter) 4 times as great as that of the former. Therefore the first Circle to the second will be as 1 to 4, or as 3 to 12. And since the *Spiral Space* is to the first Circle as 1 to 3, that Space to the second Circle will be as 1 to 12; and to a 3d Circle so described, as 1 to 27; to a 4th, as 1 to 48, &c.

II. The first *Spiral Line* is equal to half the Periphery of the first Circle; for the Radii of the Sectors, and consequently the Arches are in simple Arithmetick Progression, while the Periphery of the Circle contains as many Arches equal to the greatest; wherefore the Periphery to all those Arches, is to the *Spiral-line* as 2 to 1 (by N. 6. of *Arithm. Progression*.)

I thought one Proposition, with a Corollary or two, enough on this Subject, to give the Reader a Specimen of the *Genesis, Nature and Properties*, and way of Demonstration used about *Spiral Lines*: Those that will see more, may consult *Archimedes*, *Dr. Wallis's Arithmetick of Infinites*, or *Sturmius's Matth. Enucleat.* lib. 2. Chap. 4.

Proportional Spirals, are such *Spiral Lines* as the Rhumb Lines on the Terrestrial Globe, which because they make equal Angles with every Meridian, must also (as we shew in *Prop. 7.* of *Spherick Geometry*, which see) make equal Angles with the Meridians in the Stereographic Projection on the Plane of the Equator; and therefore will be, as the Learned Capt. *Halley* observes, *Proportional Spirals* about the Polar Point. From whence that excellent Mathematician demonstrates, That the Meridian Line is a Scale of Log. Tangents of the $\frac{1}{2}$ Meridian-complements of the Latitudes. See *Meridian Line*.



In *Proportional Spirals*; the Angles BPD, BPD, &c. or the Arches B D, B d, &c. are Exponents of the Ratios of B' P to P C. For if the Arch B D be divided into innumerable equal Parts, right Lines drawn from them to the Center P, shall divide the Curve B c c C into an Infinity of Proportionals; and all the Lines P c, P c, &c. shall be an Infinity of Proportionals between P B and B C, whose Number is equal to all the Points d d, in the Arch B D: But an infinite Number of Proportionals between the two Terms of the Ratio, is to that infinite Number of equal Parts between any other two Terms: as the Logarithm of the one Ratio is to the Logarithm of the other; therefore, as B D to B d, or as the Angle B P D to the Angle B B c; so is the Logarithm of the Ratio of P B to P C, to the Logarithm of the Ratio of P B to P c. Q. E. D.

SPIRIT, which the Chymists call Mercury, is one of the 5 Principles separable from a mixt, by Fire; 'tis subtil, light, penetrating, and active, and hath its Particles in a very quick Motion. This is probably that which causes the Growth and Encrease of all Bodies; but where it abounds most, those Bodies do soonest corrupt, because of its rapid Motion. This appears in Vegetable and Animal Bodies, which yield the greatest Quantity of Spirit; whereas most Minerals, as having but a small Proportion of Spirit in them, are almost incorruptible.

This Principle is never drawn pure, any more than the others; and when it comes over involved in a little Oil, 'tis called an Ardent Spirit, such as Spirit of Wine, which therefore should rather be called an exalted Oil; and when it hath in it a little Volatile Salt dissolved, 'tis called a Volatile Spirit, as the Spirit of Hartshorn, Urine, &c. If it be impregnated with Acid Salts, its Volatility is then check'd, and 'tis called an Acid or Fixt Spirit, as Spirit of Salt, Vitriol, Allum, &c. which truly are only an Acid Salt dissolved and put into Fusion by a strong Fire.

SPIRIT of Niter is thus drawn: Mix one part of Salt-peter with three times as much Potters-earth dried; put this Mixture into a large earthen Retort, and set it in a close Reverberatory Fire; distill off the Phlegm with a small Fire in about 4 or 5 Hours, and when no more Drops will come, lute on a very large Receiver, and encrease the Fire gradually to the 2d Degree, some more volatile Spirits will come out in white Clouds: Keep the Fire thus about two Hours, and then encrease it to the greatest Violence you can give it, the Vapours will come red; continue the Fire till no more red Fumes come; in 14 Hours the Operation will be over. If you used 2 Pounds of Nitre, you will draw 1 Pound 14 Ounces of Phlegm and Spirit together. The Vessels had need be large, and $\frac{2}{3}$ of the Retort left empty, else there will be danger of breaking all to pieces, the Spirits come forth with that Violence.

This Spirit is the best *Aqua-fortis*, and is chiefly used for Solution of Metals. But when dulcified, is a good Medicine inwardly in many Cases.

SPIRIT of Salt, is made by drying and powdering the Salt, and then mixing of it with thrice its Weight of Potters-earth powdered: A Paste is made of these two with a little Rain-water, and then the Paste is made into little Balls or Pellets about as big as Nuts. A large earthen Retort or glass one coated, hath one third of it filled with these,

these, and being placed in a Reverberatory Fire, hath a large Receiver fitted to it. The Junctures must not be luted at first, but a very moderate Fire used for a time, to distil out all the Water: But as soon as you see some little white Clouds appear, throw out the incipid Liquor in the Receiver, and Lute it well to the Retort: Then encrease the Fire by degrees to the highest, and so let it continue 12 or 15 Hours, or till no more Clouds appear; when the Operation is ended, you will find the Spirit of Salt in the Receiver. Some rectifie this Spirit afterwards in a Cucurbit, by drawing off some of the weaker Spirit in a gentle Sand-heat, and then what remains is very strong of a yellow Colour, and very weighty.

If equal Parts of this acid Spirit and Spirit of Wine are mixed together, and digested for about 3 or 4 days, 'tis called *Spirit of Salt dulcified*.

Spirit of Salt will dissolve Leaf Gold, and will precipitate what *Aqua Fortis* hath dissolved. Which shews how very differently formed and figured the Point and Pores of *Acid Menstruums* may be, and frequently are.

SPIRIT of Sulphur, commonly call'd Oil of Sulphur, *per Campanam*, (from the Vessels form being like a Glass Bell, in which it is usually drawn) is only the acid Part of Sulphur turned into a Liquor by the means of *Fire*. *Lemery* uses a great Glass Tunnel for this Operation; which seems to be the best way of drawing this Spirit, *vid.* p. 445. *last Edition*. Some make use of Salt-petre in the drawing of Spirit of Sulphur, but that is not a good Practice, because the Nitre alters something of the mixture of the Spirit.

SPIRITS in an Animal Body, were reckoned of three sorts; the Animal Spirits in the Brain, the Vital in the Heart, the Natural in the Liver: But late Authors distinguish 'em only into two kinds; the Animal in the Brain, the Vital and Natural (which are accounted the same) in the mass of Blood. The Animal Spirits are a very thin Liquor, which distilling from the Blood in the outward or Cortical Substance of the Brain, are by the proper Ferment of the Brain exalted into Spirit, and thence through the Medullar Substance of the Brain, the *Corpus Callosum*, and *Medulla Oblongata*, are deriv'd into the Nerves and Spinal Marrow, and in them perform all the Actions of Sense and Motion.

The Vital or Natural Spirits are the subtillest Parts of the Blood which actuate and ferment it, and make it fit for Nourishment.

SPLANCHNICA, are Medicines proper against Diseases of the Intestines.

SPLEN, *five Lien*, the Spleen, is a Receptacle for the salt and earthy Excrements of the Blood, that there, by the Assistance of the Animal Spirits, it may be volataliz'd, and returning again into the Blood, may concur to its farther Fermentation. The Spleen consists of a great number of little Bladders, between which the Glandules are scattered up and down, and supply the place of Veins. The Spleen has likewise an Artery, Nerves, and Lymphatick Vessels, first discover'd by *Fr. Ruisch*, says *Blanchard*. But you will find a much better Account of it in *Gibson's Anatomy*, p. 105. See Vol. 2.

SPLENA, are Bolsters made of Linen, three, four, or five times doubled, even to the thickness of the Spleen: They are used upon Wounds, Ulcers, and Fractures. The Figure is threefold, according to the manner of Application, *viz.* at length obliquely, or transversely: They are called also *Plumaceoli*, and *Plagulae*. *Blanchard*.

SPLENETICK Artery, is said by some to be the greatest Branch of the *Celiaca*, whence it goes to the *Spleen*, and therein ends.

SPLENII Musculi, arise partly from the five lower *Vertebrae* of the Neck; and partly from the points of five of the upper *Vertebrae* of the Thorax: The Fibres of these Muscles tend obliquely, and are fastened to the hinder part of the Head. The use of 'em is to draw the Head backward. It hath its Name from its Figure, being something like to an Ox's Spleen.

SPLICE. At Sea they say a Cable or Rope is *spliced*, when the ends of two pieces being untwisted, the several Strands are wrought into one another by a Fidd. Also when an Eye is to be made at the end of a Rope, the ends of the Strands are by a Fidd drawn into the ends of the other Ropes Strands; and this is called a *Splice*.

SPLIT; the Seamen say when a Sail is blown to pieces, it's Spilt.

SPOLIATION, is a Writ that lies for one Incumbent against another, in any case where the Right of the Patronage cometh not in Debate: As if a Parson be made a Bishop, and hath Dispensation to keep his Rectory, and afterwards the Patron present another to the Church, which is Instituted and Inducted; the Bishop shall have against this Incumbent, a Writ of *Spoliation* in Court *Christian*.

SPONDÆUS, is the Foot of a Latin Verse, consisting of two Syllables, and both of 'em long, as *Ingens*.

SPONGOEIDEA ossa. See *Cribriiformia*.

SPOONING, when a Ship being under Sail in a Storm at Sea, cannot bear it, but is forced to put right before the Wind; then the Seamen say, *she spoons*; and when in such a case there is Danger lest she should bring her Masts by the Board with her rowling about, or Seal under Water, and so Founder, they usually set up the Fore-sail to make her go the steadier, especially if there be Sea-room enough; and this they call *Spooning with the Fore-sail*.

SPORADICI Morbi, are those Diseases which (tho' different in Nature) seize several People at the same time, and in the same Country.

SPOTS in the Sun. 'Tis certain those opake Masses which sometimes appear at the Sun, are not Planets revolving at any, even the least distance from him, but *Spots* or *Maculae* adhering to him; for whereas they revolve but once in about 26 Days; on Calculation it will appear, that a Planet near the Sun's Surface, as these must be, cannot have above 3 Hours allowed for its periodical Revolution, which being so different from the foremention'd space of 26 Days, quite decides that Controversie, and demonstrates those Masses to be real *Maculae* adhering to the Body of the Sun, as is here asserted.

Anno 1666, April 27th, 8 H. A. M. the Honourable Mr. Boyle observed a Spot in the lower Limb of the Sun, a little towards the South of its Equator, which was entred about $\frac{1}{10}$ of the Sun's Diameter, it self being about $\frac{1}{10}$ in its shortest Diameter of that of the Sun, its longest about $\frac{1}{4}$ of the same.

May the 8th, about 10 in the Morning, it appeared near about the same distance from the Westward Limb, a little South of its Equator; tho' at first it appear'd to be from the Eastward Limb, a little South also of its Equator. May the 9th, it disap-

disappeared. This *Spot* was very dark, and almost of a Quadrangular Form, and was enclosed round with a kind of duskyish Cloud.

May the 25th, the same *Spot* appear'd again, and seem'd to be in a part of the same Line it had formerly trac'd, and was entred about $\frac{3}{4}$ of its Diameter, about 7 h. P. M. At which time there appear'd another *Spot*, which upon its entrance was not above $\frac{1}{12}$ part of the Sun's Diameter: It appear'd to be longest towards the North and South, and shortest towards the East and West: and there seem'd to be dispers'd about it divers small Clouds here and there.

Anno 1671, August the 11th, 6 h. P. M. Mr. Cassini, by the help of a Three-foot Glas, observ'd in the Sun's Disk two *Spots* very dark, and distant from his apparent Center about $\frac{1}{3}$ of his Semidiameter.

But, that he might the more exactly note their Situation, in respect of the several Parts of the World, he made use of two very fine Threads, cutting one another at Right Angles in the common Focus of the two Glasses, and in the Axis of the Telescope; so that he might see the Sun's Center, and according as one of these Threads advanced Westward, it mark'd in the Sun a Circle parallel to the Equator; and the other Thread mark'd the Circle of Declination, or the Horary Circle. Then he observ'd that the *Spots* were in the Southern part of the Sun; that their Elongation from this Parallel, passing thro' his Center, could be no more than about $\frac{1}{8}$ of his Diameter; and that they were situat on the Eastern-side in respect of the said Center of the Sun. He also measur'd several times, from 6 a Clock at Night, to 7, the time which lap'd between the passage of the Sun's Center, and that of the first of these *Spots*, thro' the said Horary Circle, which sometimes he found to be 23, sometimes 22 Seconds, the Semidiameter of the Sun then passing in 66 Seconds.

August the 12th, he observ'd them from the time of Sun-rising, and perceiv'd that now they were nearer his Center. The time between the passage of the Sun's Center, and that of the interior edge of the Coronet which encompass'd them both, was then of 16 Seconds. At 7 a Clock it was but of 15, and the Southern Limb of the Coronet touch'd the Parallel passing through the Sun's Center.

From 6 at Night unto 7, the time between the passage of the Sun's Center and that of the Coronet's Limb, was found to be one time of 8 Seconds, at another time of 7", and another of 7" $\frac{1}{2}$. The distance of the *Spot* unto the Parallel, passing thro' the Sun's Center, was near the same on the North-side, with what it had been observ'd to be in the Morning on the South side.

August the 13th, about 6 in the Morning, the edge of the Coronet was distant from the Equator, on the North-side, 39 Seconds; and there was but one Second of Time from the passage of the Sun's Center into the passage of the same anterior edge of the Coronet.

At 8 h. 30', the Fore-edge was in the same Horary Circle with the Sun's Center; so that in one Day and an half, these *Spots* have run thro' very near the third part of the Sun's apparent Semidiameter, which giveth an Arch of 19 Degr. 30 Min. of the Circumference of the Sun's Body; and consequently their Diurnal Motion about the Sun's Axis hath been of 13 Degr. and the time of

their Periodical Revolution as far as could be conjectured in so little Time, must be about 27 Days and a half; which was confirm'd afterwards by farther Observations. *Phil. Trans.*

August the 30th, 1671, Dr. Hook observ'd a large *Spot* in the Center of the Sun's Face about Noon.

Sept. the 1st, he saw the same *Spot* again, and observ'd it to be mov'd about $\frac{1}{2}$ of the Sun's Diameter Westward.

April the 25th 1683, Mr. Flamsteed saw a large *Spot*, having 3' 40" more North Declination than the Sun's Center, and at 3 h. 35' after Noon he measur'd its Distance from the next Limb, 0', 40".

April the 26th, he saw it more remote from the Limb, and at 8 a Clock determin'd its Longitude from the Sun's Axis 66 $\frac{1}{2}$ Degr. and its Declination from the Solar Equator 8 $\frac{1}{2}$ Degr. South.

The Revolution of this *Spot*, Mr. Flamsteed found to confirm his former Theory of the Sun's Motion round his Axis in 25 d. 6 h. and that the Angle of his Equator and our Ecliptick is 7 Deg. and the Longitude of his Northern Pole was in 16°.

SPRING of the Air, or its Elastical Force, see more in Air.

That there is such a Spring or Elasticity in the Air, is clear from the following Experiments.

1. That Bladders but half blown up, and having their Necks well tied, did swell in their exhausted Receiver as if blown to their full Dimensions; and that full blown Bladders, and even thin square glass Viols well stop'd, will break to pieces when once the Air is well pump'd out of the Receiver.

2. A glass Syphon whose recurved Leg was turn'd up parallel to the upper and longer, and was seal'd Hermetically at the end of the lesser or shorter Leg, had a Quantity of Quicksilver pour'd into it, and by its being mov'd often up and down, the Air in the sealed and shorter Leg, was brought to the same Temperament of the External. After this more Mercury was pour'd in, till the Air in the sealed Leg was compress'd into about half its usual Dimensions; and then the Mercury in the longer Leg was 29 Inches higher than that in the shorter: By which it appears plainly, That the Spring of the Air in the sealed Leg was so great, as to equiperponderate a Column of Mercury of 29 Inches in Length. Boyle against Linus.

3. A Viol fill'd to but a 4th part with Quicksilver, had a long and slender glass Pipe fasten'd into its Neck, with Sealing-Wax or Cement, whose lower Orifice was a good way under the Quicksilver in the Viol; then having blown in a little Air, to try whether the Viol were well stopp'd, it was convey'd into a long and slender Receiver; and after the Air was drawn off by the Pump, the Spring of the included Air within the Bottle, impell'd the Mercury up to the Height of 27 Inches in the Pipe, and there kept it suspend'd; till upon the Re-admission of the Air, the Quicksilver fell down to its first Station in the Pipe. This Experiment Mr. Boyle often tried, and with desir'd Success.

And when it was tried with a Bottle that held a Quarr, the Spring of such a Quantity of Air was able to raise the Mercury up to 29 Inches $\frac{7}{8}$. But nothing could make it raise above the common Height of the Quicksilver in the Baroscope.

4. Into a Copper Vessel of a Cylindrical shape, was put almost Water enough to fill it, and then was immersed into it and kept under Water by a Weight, a square glass Viol that would hold 9 or 10 Ounces of Water, and was well stopp'd: After this, Mr. Boyle placed the Copper Vessel in his *Pneumatical Engine*, and pumping up the Air, he found, That the Spring of the Air included in the Viol broke it all to Pieces, tho' under Water, with a great Noise, and made a kind of Smoak or Mist appear above the Surface of the Water.

Which Experiment proves both the great Force of the Natural Spring of the Air, when the Weight of the Atmosphere is removed; and also that the Weight of the Atmosphere acts upon Bodies under Water; for that could by its universal pressure keep the Spring of the Air in the Bottle bent while it was under the Surface of the Water; but when once *that*, by plying the Pump, was taken off, the Elastic Particles unbent themselves violently, and broke the Viol. See the Experiments about the Pressure of the Airs Spring on Bodies under Water.

The Spring of the Air, is equal every where in a natural State to the Weight of the incumbent Atmosphere; just as if a Person should squeeze or compress together either by the force of his Hand, or by a Weight, any parcel of Wool, or such Elastic Bodies, the Wool would by its Spring equally press against the Hand or Weight. According to the third Axiom of Sir Isaac Newton's Principia, *Actioi contrariam semper & aequalm esse Reactionem.*

The Accurate Dr. Hook on Experiments well made, thinks we may conclude the Spring of the Air to be Reciprocal to its Extension. *Micrograph. p. 227.*

And the Resistance of the Spring of the Air, is found to be nearly equal to the Weight or Force that compresses it; and the Spaces that the same Air occupies under differing Pressures, are Reciprocally as those Pressures.

The Quantity of the Dilatation and Expansion of Air only by the Operation of its Spring, without any additional Heat, Mr. Boyle found to be so great, that a Bubble of Air included in a proper glass Pipe almost filled with Water, was extended to above 150 times its former Dimensions; and he believes would have taken up 200 times its former Room, had the Tube been long enough to have tried the Experiment. *New Exper. Phys. Mech. Edit. 3. p. 32, 33.*

He found also, that a Cylinder of Air of an Inch in Diameter, and less than two Inches in Length, would, when included in a Bladder, and the Weight of the Atmosphere taken off by pumping, by its bare Spring only, raise a Weight of above 10 Pounds *Averdupos*.

He found also, that the Spring of a Cylinder of Air of 2 Inches Diameter, and of the former length, was in the same Engine able to raise up 42 Pound Weight.

Whence it appears, that the Force of the Spring of different Cylinders of Air is in a duplicate Ratio, to the Diameters of those Cylinders.

The Spring of the Air, may be explicated either by supposing the Air near the Earth to consist of an heap of such little Springy or Elastic Bodies lying one upon another resembling those of a Fleece of Wool.

Or else according to D. Cartes his way by supposing, That the Air is nothing but a Congeries of flexible Particles of several kinds of Figures and Sizes, which are raised by Heat into the fluid and subtile *Ethereal Matter* that furrounds the Earth, and by the continual Agitation of that Matter, wherein those Particles swim, are so whirled about, that each Corpuscule endeavours to beat off all others from coming within the little Sphere requisite to its Motion about its own Center, and (in case any, by intruding into that Sphere shall oppose its free Rotation) to drive it away.

SPRING a Mast; so the Seamen call it, when a Mast is only crack'd, but not quite broken, in any part of her; as in the *Partners*, the *Hounds*, &c. then they say, *The Mast is Sprung.*

SPRING-Arbor, in a Watch, is that part in the middle of the Spring Box which the Spring is wound or turned about, and to which it is hooked at one end.

SPRING-Box, is that Cylindrical Case or Frame that contains within it the Spring of a Watch or other Movement.

SPRING-Tide, is the increasing higher of a Tide after a dead Neipe; this is about 3 Days before the Full or Change of the Moon; but the top or highest of the Spring-Tide is 3 Days after the Full or Change; then the Water runs highest with the Flood, and lowest with the Ebb, and the Tides run more strong and swift than in the Neipes.

SPRINGS and Fountains. Concerning the Origin of these, there is much Dispute, especially of such as are found on the tops of high Mountains.

Some, as Dr. Hook, Dr. Plot, and many others, think that they arise from the Sea-water percolated through the Bowels of the Earth, which by that means being deprived of its Salt, is rendered much Lighter than before, and so is capable of rising up to the height we commonly find Springs at, as Water rises in a Filtre, or in very small Tubes, &c.

And Dr. Hook hath a pretty Experiment about this, in his *Microgr. p. 25.*

But I cannot see how by this Hypothesis, supposing the Gravity of the whole Atmosphere could be taken off, Water can arise above 34 or 35 Foot above the level of the Ocean.

The Learned Capt. Halley supposes them to be caused from the Vapours exhaled by the Sun out of the Sea, &c. Of which see an Account under the Word Vapour.

The Ingenious Dr. Woodward, in his Natural History of the Earth supposes, That the great Abyss of Waters placed in the Bowels of the Earth, is the standing Fund and promptuary which supplies Water to the Surface of the Earth, and furnishes as well Springs and Rivers, as Vapours and Rain.

For he asserts, That there is a nearly uniform, and constant Fire or Heat, disseminated thro'out the Body of the Earth, and especially in the inferior Parts of it: The Bottoms of the deeper Mines being very sultry; and the Stone and Ores there being very sensibly hot even in Winter. That 'tis

this subterraneous Heat which evaporates and elevates the Waters of the Abyfs, buoing it up indifferently on all Sides, and towards all Parts of the Surface of the Globe.

That this rising Vapour, or Water, pervades not only the Fissures and Intervals of the *Strata*; but the very Bodies of the *Strata* themselves; permeating the Interstices of the Sand, Earth, or other Matter, whereof they consist; yea, even the most firm and dense Marble and Sand-stone; for these give Admission to it, tho' in lesser Quantity, and are always found saturated with it; which is the reason that they are softer, and can be cut much more easily when they are first taken out of the Earth, than they can afterwards, when they have lain some time exposed to the Air, and when that Humidity is evaporated.

This Vapour he asserts to proceed directly up towards the Surface of the Globe, on all sides, unless when impeded and diverted by the Interposition of *Strata* of Marble, the denser sorts of Stone, or other like Matter, which is so close and compact, that it can admit it only in a smaller Quantity, and this very slowly too.

And when it is thus intercepted in its Passage, the Vapour which cannot penetrate the *Stratum* directly, will some of it glide along the lower Surface of the *Stratum*, permeating the Horizontal Interval, which is betwixt that and the next *Stratum* lying underneath it; the rest will pass the Interstices of the Mass of the subjacent *Strata*, whether they be of laxer Stone, of Sand, Marble, or the like, with a Direction parallel to the site of those *Strata*, till it arrives at their perpendicular Intervals.

And when the Water is once come to these Intervals, in case the *Strata*, whereby the ascending Vapour was collected and condensed into Water, (as we usually speak) in like manner as by an Alembick, happen to be raised above the Level of the Earth's Surface; as those *Strata* always are, whereof Mountains do consist; then the Water being likewise got above the said Level, flows forth of those Intervals or Apertures; and if there be no Obstacle without, forms *Brooks* and *Rivers*. But where the *Strata*, which so condense it, are not higher than the mean Surface of the Earth, it stagnates at the Apertures, and only forms *standing Springs*.

He adds, That tho' this Supply of Water from the Abyfs, be continual, and nearly the same at all Seasons and alike to all Parts of the Globe, yet when it arrives at or near the Surface of the Earth, where the Heat (the Agent which evaporates and bears it up) is not so constant and uniform, as is that resident within the Globe, but is subject to Vicissitudes and Alterations, being at certain Seasons greater than at others; being also greater in some Climates and Parts of the Earth than in others: It thence happens that the Quantity of Water at the Surface of the Earth, tho' sent up from the Abyfs with an almost constant equality, is various and uncertain, as is the Heat there at some Seasons, and in some Countries, the Surface abounding, and being even drown'd with the Plenty of it, the Springs full, and the Rivers high: At other Seasons and in other Countries, both Springs and Rivers may be exceeding low, and sometimes totally fail.

When the Heat in the exterior Parts of the Earth, and in the Ambient Air, is as intense as that in the interior Parts of it, then all that Water which

passes the *Strata* directly, mounting up in separate Parcels, or in form of Vapour, does not stop at the Surface, because the Heat there, is equal both in Quantity and Power to that underneath, which brought it out of the Abyfs.

This Heat therefore takes it here, and bears it up; part of it immediately out of the Surface of the Earth; the rest thro' the Tubes and Vessels of the Vegetables which grow thereon, Herbs, Shrubs, and Trees, and along with it a sort of Vegetative Terrestrial Matter, which it detaches from out the uppermost *Stratum* wherein these are placed; this it deposits in them for their Nourishment as it passes thro' them, and issuing out at their Tops and Extremities, it marches still on; and is elevated up into the Atmosphere, to such an height, that the Heat there being less, it becomes condensed, unites and combines into small Masses, or Drops, and at length falls down again in Rain, Dew, Hail, or Snow.

And for the other part of the Water, which was condensed at the Surface of the Earth, and sent forth collectively into *standing Springs* and *Rivers*; this also sustains a Diminution from the Heat above, being evaporated more or less in Proportion to the greater or lesser Intensity of the Heat, and the greater or lesser Extent of the Surface of the Water so sent forth.

And as these Evaporations are at sometimes greater, according to the greater Heat of the Sun, so where ever they alight again in Rain, 'tis so much superior in Quantity to the Rain of colder Seasons, as the Sun's Power is then superior to its Power in those Seasons: This is apparent in our Northern Climate, where the Sun's Power is never very great, but yet our Rains in June, July, and August, are much greater than those of the colder Months, the Drops larger, and consequently heavier, and falling much thicker and faster than at other times.

But much more apparent is this in the Regions of the Earth, nearer to, or under the Equator, where the Sun having a much greater Force, their Rains (which are Periodical, happening usually about the same time, and lasting several Months) fall in such Quantities as to be more like descending Rivers than Showers; and by these are caused the mighty Inundations of the Nile, and other Rivers in those Regions.

But when the Heat in the exterior parts of the Earth, and in the Ambient Air, is less than that in the interior; the Evaporations are likewise less; and the Springs and Rivers do not only cease to be diminished, proportionably to the Relaxation of the Heat, but are much augmented, a great part of the Water which ascends to the Surface of the Earth, stopping there for want of Heat to amount it thence up into the Atmosphere, and saturating the superficial, or uppermost *Strata* with Water; which by degrees drains down into Wells, Springs, and Rivers, and so makes an Addition to them; and is the reason that these abound with Water in the Colder Seasons, so much more than they do in the Hotter.

And the Water which is thus dispensed to the Earth and Atmosphere from the great Abyfs, being carried down by Rains and by Rivers, into the Ocean, which communicates with the Abyfs, is by that means restored back again to it; and from thence it returns again in a continual Circulation,

to

to the Surface of the Earth, in Vapours and Springs.

SPRINGY, or *Elastick Bodies*, are such as having had their Figure changed by the Stroak or Percussion of another Body, can recover again their former Figure; which Bodies which are not Elastical will not do. Thus, If a piece of Steel be bent any way, it will recover again its former straitness, but a piece of Lead will stand bent in any form.

SPUNGING of a great Gun, is clearing of her Inside, after she hath been discharged, with a Wad of Sheep-skins, or the like, rolled about one end of the Rammer: Its design is to prevent any parts of Fire from remaining in her; which would endanger the Life of him who should load, or charge her again.

SPUN-YARN, or Rope-yarn, whose Ends are beaten or scraped thin, in order to fasten one piece to another, that so it may be as long as is necessary: It is of use to make *Caburns*, and for many other Purposes aboard a Ship.

SPURLE. See *Nothe cofke*.

SPURKETS, are the Spaces in a Ship's Side, betwixt the upper and lower Futtocks, or betwixt the Rungs fore and aft.

SQUAMMOSA *Sutura*, is one of the Sutures of the Bones of the Skull; so called, because the Parts of the Bones united by the Suture, do lie very slope, and like Scales.

SQUARE, is an Instrument of Brass, or Wood, having one side perpendicular, or at Right Angles to the other; sometimes made with a Joint to fold (for the Pocket) and sometimes has a Back to use on a drawing Board, to guide the *Square*.

SQUARE Figure, in Geometry, is one whose Right-lined Sides are all equal, and its Angles all right. See *Quadrilateral*: For its *Area*, see *Area*.

SQUARE Number, is one multiplied into itself; as 4, which arises from the Multiplication of 2 by 2; and 9, the Product of 3 by 3; also 16 made by 4, multiplied by 4, &c.

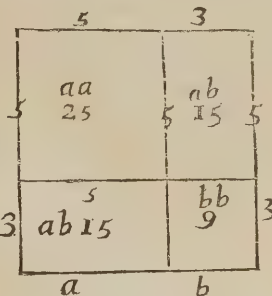
And a *Square Number* may be ranged into the Form of a Square, but that which cannot be so ranged, cannot be a *Square Number*.

The Square of any Number, or Line, as $5 + 3$, or $a + b$, divided into two Parts, is equal to the Sum of the Squares of those Parts, and also to the double Rectangle, or Product of those Parts, as is plain from only multiplying $a + b$ by it self, Algebraically. See *Euclid. Lib. 2. Prop. 4*.

Thus the Square of $5 + 3$, or 8, which is 64, is equal to

$$\begin{array}{r} aa \quad 25 \\ bb \quad 9 \\ 2ab \quad 15 \\ \hline \end{array}$$

$$Qa + b = aa + 2ab + bb = 64$$



To Compose any Square Number according to this Proposition.

$$\begin{array}{r} 2 \quad 5 \\ \hline 4 \quad . \quad . \quad aa \\ 2 \quad 0 \quad . \quad 2ab \\ . \quad 2 \quad 5 \quad bb \\ \hline 6 \quad 2 \quad 5 = \square 25 \end{array}$$

1. Write the Number down with the Distance of one Place between each Figure.

2. Find the Square of 2, the first Figure to the left Hand, writing it down under 2.

3. Then write the double Rectangle of 2 multiplied by 5, i. e. 20, under 4, as in the Margin.

4. Then Square 5, and write its Square down in that Order, as you see; and adding all together into one Sum, you will have $625 = \square 25$.

When a Number consists of more than two Places, proceed thus.

1. Find the first Square as before.

2. Multiply the two first Figures (towards the left Hand) and write down the Product twice, one under another.

3. Then find the Square of the second Figure, which write in its proper Order as before; add all these into one Sum for a new Square of a .

4. Then multiply the third Figure into the second, which taken together make a ; and write its Product down twice as before (in Step. 2.)

5. Square the third Figure, and subscribe its Square as before (in Step. 3.) then add all into one Sum, and repeat this Process as often as there is Occasion; the last Sum of all is the true Square required.

Thus,

$$\begin{array}{r}
 3 \ 6 \ 5 \\
 9 \dots \quad a \ a \\
 18 \dots \quad \left. \begin{array}{l} 18 \dots \\ 18 \dots \end{array} \right\} 2 \ a \ b \\
 36 \dots \quad b \ b \\
 \hline
 1296 \dots \quad a \ a \\
 180 \dots \quad \left. \begin{array}{l} 180 \dots \\ 180 \dots \end{array} \right\} 2 \ a \ b \\
 25 \dots \quad b \ b \\
 \hline
 \end{array}$$

$$133225 = \text{Square of } 365.$$

From which Method of composing a Square, 'twill be easie to understand the way to extract the Square Root of any Number given,

As suppose 133225 . For,

1. Beginning at the right Hand, make a Point over the first Figure (5); and after that over every other Place alternately: Which Points shew you the Number of Places in the Root.

2. Find the nearest Square Root to the first part 13, which is 3, write it in the Quotient, and then place its Square (9) under, and subtract it from 13. This Root is a , and the Square $a \ a$.

3. To the Remainder (4) bring down the next Square 32, which will make 432, and will be equal to $2 \ a \ b + b \ b$, in the last Step of all, else always bigger, and is called the *Resolvend*. Then double the Figure (3) in the Quotient, and make it a Divisor to all the *Resolvend*, except the last Figure towards the right Hand, enquiring how often you can have 6 in 42, and place the Answer 6 (for tho' you can have it 7 times, yet 7 must not be taken, because 'tis too large) in the Quotient, and also after 6 in the Divisor. Then multiply the thus augmented Divisor by 6, and write the Product under, and subtract it from the *Resolvend*: To the Remainder 36, bring down the next Square 25, and then you have 3625 for a new *Resolvend*: Then, as before, double the Quotient 36, which makes 72 = $2 \ a$, for a new Divisor, and enquire how often you can have 72 in 362, write the Answer 5 = a in the Quotient, and also after the Divisor; and multiplying the augmented Divisor by it, you will have a Product 3625, = $2 \ a \ b + b \ b$, which subtracted from the *Resolvend*, leaves nothing, and so the Work is over, and the true Root found to be 365. If there had been more Points, the Work in this third Step must have been repeated till all was done.

The Example follows.

$$\begin{array}{r}
 133225 \quad (365 \\
 a \ a = 9 \\
 \hline
 2 \ a + b = 66) \quad 432 = \text{Resolvend.} \\
 \quad \quad \quad 396 = 2 \ a \ b + b \ b \\
 \hline
 2 \ a + b = 725) \quad 3625 = \text{Resolvend.} \\
 \quad \quad \quad 3625 = 2 \ a \ b + b \ b \\
 \hline
 0000
 \end{array}$$

But when a whole Number hath not a Square Root exactly expressible by any rational Number, then to approach infinitely near the exact Root, proceed thus.

Place as many Pairs of Cyphers on the right Hand of the Remainder, as you would have Decimal Places in the Root, and work as before, distinguishing them from the Integers by a Comma, thus: If the Square Root of 12 be desired to three Places in Decimals; annex 6 Cyphers to 12, and 'twill stand thus:

$$12, 000000$$

Whose Square Root being extracted, is found to be 3, 464, or $\frac{464}{1000}$, but because of the Remainder, it must be that 3, 464 is less than the true Root, and 3, 465 greater than it; yet not wanting the $\frac{1}{1000}$ of an Unite of the true Root.

The Square Root of a Vulgar Fraction, is thus found.

First, if the Fraction be not in its least Terms, let it be reduced to the least Terms; then extract the Square Root of the Denominator for a new Denominator, and of the Numerator for a new Numerator; this new Fraction shall be the Square Root of the Fraction proposed. Thus the Square Root of $\frac{1}{16}$ is $\frac{1}{4}$, of $\frac{1}{9}$ is $\frac{1}{3}$.

If the vulgar Fraction given, be incommensurable to its Square Root, both in the given Terms, and also in any other Terms that it is reducible to; then reduce the said Vulgar Fraction into Decimals, consisting of an even Number of Places; and then extract the Square Root thereof by Approximation, according to the Precepts already delivered.

Thus: If the Square Root of $\frac{1}{4}$ be required, its equivalent Decimal is 75, whose Square Root, 86602, &c. Therefore the Square Root of $\frac{1}{4}$ is, 86602 *ferè*.

If a mix'd Number were given for Extraction, whose Fractional Part is express'd in Terms of a Vulgar Fraction; reduce it into an improper Fraction, and (if commensurable, extract the Square Root of the Numerator and Denominator, (as before;) observing to reduce the Fractional Part of the mix'd Number, (or the improper Fraction equivalent to the mix'd Number) into its least Terms.

Thus: The Square Root of $5\frac{1}{4}$ is $2\frac{1}{2}$, for the improper Fraction equivalent to $5\frac{1}{4}$ is $\frac{21}{4}$, and the Square Root of $\frac{21}{4}$ is $\frac{3}{2}$, or $2\frac{1}{2}$.

S Q U

To extract the Square Root, according to the Method of Converging Series.

Suppose $aa = c = 2$.

For a take any Binomial, as suppose $r + S$; 'tis best to make $r = 1$, (i. e.) to the first Root, or Side of the given Square, because then S will converge the sooner.

Then will $rr + 2rS + SS = aa = c$.

Reject the Power of S , as being of small Value.

Then will $rr + 2rS = c$, or $2rS = c - rr$

Divide all by $2r$; and then $S = \frac{c - rr}{2r}$

which is the standing Theorem.

Suppose therefore $r = 1$; then $\frac{c - rr}{2r} = \frac{2 - 1}{2} = \frac{1}{2}$

Make $2r$ the Divisor $1, 0, 5 = S$
To the first $r = 1$, add $5 = S$, for a second r , in order for a new Operation.

Then $1, 5$ is the new r , the Square of which, is $2, 25 = rr$; from which subtract $2 = c$, because 2 is less than $2, 25$, and 'twill stand thus.

$$\begin{array}{r} rr = 2, 25 \\ - c = 2 \\ \hline 2r = 3) 0, 25 \end{array}$$

Which must be divided by $2r = 3$, and the Quotient will be $0, 83 = S$; which having a defective Sign, must be subtracted from the last.

$$\begin{array}{r} r = 1, 5 \quad 1, 5 \\ - , 083 \\ \hline 1, 417 \end{array}$$

Which will be a new r , for a third Operation; and its Square being $2, 007889 = rr$, (as before greater than $2 = c$.) Take $2 = c$ from it, thus.

$$\begin{array}{r} rr = 2, 007889 \\ - c = 2 \\ \hline \end{array}$$

Leaves $0, 007889 = S$.

Which being divided by twice the last $r = 2, 834$, gives in the Quotient $0, 002783 = S$; and this S subtracted from the last.

$$\begin{array}{r} r = 1, 417 \\ , 002783 \\ \hline 1, 414217 = a \end{array}$$

Which gives the Root at 7 Places at three Operations.

But if more exactness be necessary, call it a new r , for a fourth Operation, and proceed just as before.

N. B. This Method, which is Mr. Raphson's, is very pretty, but it labours under two Inconveniences, viz. The greatness of the Divisors, and the high Involutions; especially in extracting Roots out

S Q U

of higher Powers, as the Cube, Biquadrate, Fifth, Power, &c.

To obviate which, 'tis much better to use the following way, which is Mr. Ward's.

Let as before $aa = c = 2$, and $r + S = a$.

Then $rr + 2rS + SS = aa = c$.

Divide all by 2 ; then 'tis $\frac{1}{2}rr + rS + \frac{1}{2}SS$

$= \frac{C}{2}$ the Refolvend; and $rS + \frac{1}{2}SS = \frac{1}{2}C$

$-\frac{1}{2}rr = D$, the Dividend.

Whence arises this Theorem, $\frac{D}{r + \frac{1}{2}S} = S$, by dividing all by $r + \frac{1}{2}S$.

Let then (as before) the Square Root of $2 = C = aa$, be required.

First, Take $r = 1$: Then halve the Refolvend

$= \frac{C}{2} = 1$: And from it take $\frac{1}{2}rr = .5$, there remains $5 = D$. Make

$r = 1$, the Divis. $.50$ ($4 = S$, subcri. $\frac{1}{2}SS = 8$ under $48 = rS + \frac{1}{2}SS$ [the Cypher.

Di. $= r + S = 1, 4$ 20 (20 ($1 = S$ $145 = rS + \frac{1}{2}SS$

Di. $= r + S = 1, 41$ $.5500$ ($3 = S$ $4234, 5 = rS + \frac{1}{2}SS$

$r + S = 1, 413$ 126550 ($8 = S$ $113072 = rS + \frac{1}{2}SS$

$r = S = 1, 4138$ 1347800 ($9 = S$ $127246, 5 = rS + \frac{1}{2}SS$

$1, 41389$ 7533500 ($5 = S$ $7069462, 5 = rS + \frac{1}{2}SS$

$\therefore a = 1, 413895. 464037, 5$.

This Root $a = 1, 413895$ differs from the former Root found, but by $0, 000022$ (a little more than $\frac{1}{4545454}$) for no exact Root can be found by either way.

Here also, if more exactness had been required, the Remainder encreased by Cyphers, might have been made a new Dividend, and $1, 413895$ a new Divisor; and so you may proceed on as far as you think fit.

The vast Advantage of this Method above the former, any one will soon find that will try both.

An Example of this way, in a true Square Number.

The Square Root of 133225, is required.

$$\begin{array}{r}
 r = 3 \quad 66612.2 = \frac{1}{2} C. \\
 -4, 5 = \frac{1}{2} r r S S \\
 \hline
 \text{Divisor} = r = 3) 216 (6 = S. \\
 198 = r S + \frac{1}{2} \\
 \hline
 r = 36) 1812, 5 (5 = S \\
 1812, 5 = r S + \frac{1}{2} S S \\
 \hline
 0000,0
 \end{array}$$

Therefore $a = 365$.

SQUARING. By the Word *Squaring*, Mathematicians understand the making of a Square equal to any Figure given. Thus the *Quadrature* or *Squaring* of the Circle, is the finding a Square equal to the Area of a Circle, which hath not yet been done Geometrically.

SQUINANCY, or *Quinsy*, a Swelling and Inflammation in the Throat. See *Angina*.

STAGMA, are Juices of Plants mix'd together in order to Diffillation.

STALACTITÆ, are a sort of stony, sparry Icefiles which hang down from the Top or Arches of Grotto's, Caves, or Subterranean Caverns, and from the Roofs of the Buildings and Capitals of the Pillars of such Places as are built over the *Therma*, or Hot Springs. Of this kind are the *Sal Alumen* and *Vitriolum Stalacticum*, the *Minera Ferri-stalactica*, the *Vitriolum Capillare*, and the *Alumen Capillare*, &c. These Stalacticæ Dr. Woodward faith, should rather be called *Stagonitæ*.

STAMINA, in Botany, are those little fine Threads or Capillaments which grow up within the Flowers of Plants encompassing round the *Style*, and on which the *Apices* grow, at their Extremities. Whence the Botanists call that a

STAMINEOUS Flower, which is so far imperfect, as to want those coloured Leaves which are called *Petale*, and consists only of the *Stylus* and the *Stamina*.

And such Plants as do bear these *Stamineous Flowers* Mr. Ray, makes to constitute a large Genus of Plants, which he calls *Herbe flore Imperfecto five apetalo Stamineove*.

And these he divides into such as,

1. Have their Fruit or Seed totally divided from the Flower; and these are such Plants as are said to be of *different Sexes*: The reason of which is, that from the same Seed some Plant shall arise with Flowers and no Fruit, and others with Fruit and no Flowers: As *Hops*, *Hemp*, *stinging Nettles*, *Spinach*, *Cynorumbe*, *Mercariale*, and *Phyllon*.

2. Such as have their Fruit only a little disjoin'd from their Flowers; as the *Ambrosia*, *Bardana minor*, *Ricinus*, and the *Heliotropium Tricoccon*.

3. Such as have their Fruit immediately contiguous, or adhering to their Flower: And the Seed of these is either,

1. *Triangular*: And of this sort, some are lucid and shining, as the *Lapathum*, *Rhabarbarum*, and *Bistorta*, to which also may be reckoned the *Persicaria*.

Others are rough and not shining; as the *Hel-leberus Albus*, *Fegopryum*, *Convolvulus niger*, and the *Polygonum*.

2. Such as have a roundish Seed a little flattened or compressed, or of any other Figure but the former *Triquetrous* or *Triangular* one. And these have their Flower, or the Calyx of the Flower adhering to the *Bottom* or *Basis* of the Seed or Fruit; as the *Potamogeton*, *Blitum Silvestre*, *Poriataria*, *Atriplex*, *Blitum Sativum*, *Amuranthes Hoclocerieus*, and the *Saxifraga Aurea*.

3. Such whose Flowers adhere to the top or uppermost of the Seed; as the *Beta*, *Asarum*, *Archimilla*.

And to these kind of Plants, Mr. Ray reduces also the *Kaligenicatarum Sedum fruticosum*, the *Scoparia*, or *Belvidere* of the Italians.

STANCHIONS in a Ship, are those Timbers which being set up Pillarwise, do support and strengthen the waft Trees.

STANDING Part of the *Sheat*, is that part which is made fast to a Ring at the Ship's Quarter. When they say, *Over-hale the Sheat*, they mean, *Hale upon the standing Part*; But when they say, *Hale the Sheat* barely, they intend it only of the *Running Part*.

STANDING Ropes, are those Ropes which do not run in any Blocks, but are set taught, or let slack, as occasion serves, as the *Sheat-stays*, *Back-stays*, and the like.

STANDING Part of a Tackle aboard a Ship, is the end of the Rope where the Block is seized or fasten'd; as the other which is haled, is called *Fall*.

STAPES, or the *Stirrop*, because of its resemblance to a Stirrop, is a little Bone in the Ear, of a Triangular Figure, and is made of two Branches set upon a flat Basis, which stands upon the *Foramen Ovale*; the Union of the two Branches is called the Head of the *Stapes*, in which there is a small Cavity, wherein lies another little Bone.

STAPHYLOMA, is a Disease of the Eye, in which the two Tunicks of the Eye, *Cornea* and *Uvea*, being broken, fall outward in the shape of a Grape.

STAR, in Fortification, is a Work with several Faces generally composed of from 5 to 8 Points with Salient, and Re-entrant Angles flanking one another; every one of its Sides containing from 12 to 25 Fathoms.

STARBOARD, the right Hand side of a Ship, as Larboard is the left: Thus they say, *Starboard the Helm*, or Helm a Starboard; when he that Commands would have the Man at the Helm put the Helm to the right side of the Ship.

STAR-Fort. See *Fort*.

STARS. See *Fix'd Stars*.

STATICAL Baroscope, an Instrument invented by the Honourable Mr. R. Boyle, whose Description see in *Baroscope*.

STATICAL Hygroscope. See *Hygroscope*.

STATICKS, is a Science purely Speculative, being a Species of *Mechanicks*, conversant about Weights, and shewing the Properties of the *Heaviness* and *Lightness*, or *Æquilibria* of Bodies. When it is restrained to the Specifick Weights and

Æqui-

Æquilibria of Liquors, it is called Hydrostaticks; which see.

STATION, in Astronomy, signifies certain Places of the *Zodiack*, where a Planet being arriv'd, seems to stand still for some time in the same Degree, either in ascending to its *Apogee*, or descending to its *Perigee*.

STATION, is a place where a Man fixes himself and his Instrument, to take (as in Surveying) any Angles or Distances.

STATION-Line. See *Line of Station*.

STATION-Staff, is an Instrument consisting of two Rulers that slide to ten Foot, divided into Feet and Inches, with a moving Vane or Sight; two of which are used with a Level; and on the Edges, there are the Links of the Gunter's Chain divided. It is used in Surveying for the more easie taking Off-sets.

STATIONARY; a Planet is said to be *Stationary*, when to any Eye placed on the Earth, it appears for some time to stand still, and to have no progressive Motion forward in its Orbit round the Sun.

STATUS Morbis. See *Acme*.

STATUTE, is a Word that hath divers Significations; as first, it signifies an Act of Parliament made by the King and the Three Estates of the Realm; in which Sense it is either General or Special. In another Signification, *Statute* is a Short Writing, called a *Statute-Merchant*, or a *Statute Staple*; which see. *Statutes* are also vulgarly taken for the *Petit-Sessions*, by 5 *Eliz. cap. 4.*

STATUTE-Merchant, is a Bond acknowledged before one of the Clerks of the *Statutes-Merchant* and Mayor, or Chief-Warden of the City of London, or two Merchants of the said City for that purpose assigned, or before the Mayor, Chief-Warden, or Master of other Cities or good Towns, or other sufficient Men for that purpose appointed, Sealed with the Seal of the Debtor and of the King, which is of two pieces; the greater is kept by the Mayor Chief-Warden, &c. and the lesser by the said Clerks.

STATUTE-Staple, is so called either properly or improperly. A *Statute-Staple*, properly so called, is a Bond of Record, acknowledged before the Mayor of the *Staple*, in the Presence of one of the two Constables of the same *Staple*; for which Seal, the Fee is of every Pound, if the Sum exceed not 100 *l.* an Half-penny; and if it exceed 100 *l.* a Farthing; and by Virtue of such *Statute-Staple*, the Creditor may forthwith have Execution of the Body, Lands, and Goods of the Debtor. *Statute-Staple* improperly, is a Bond of Record, founded upon the Stat. 23 *H. 8. cap. 6.* Of the Nature of a proper *Statute-Staple*, as to the Force and Execution of it; and acknowledged before one of the Chief Justices; and in their Absence, before the Mayor of the *Staple*, and Recorder of London.

STATUTUM de Laboratoris, is a Writ Judicial, for the apprehending of such *Labourers* as refuse to work according to the Statute, Reg. Judic. Fol. 27.

STATUTO Mercatorio, is a Writ for the Imprisoning of him that has forfeited a Bond called *Statute-Merchant*, until the Debt be satisfied. Of these, there is one against Lay-persons, and another against Ecclesiastical.

STATUTO Stapule, is a Writ that lies to take his Body to Prison, to seize upon his Lands and

Goods, that hath forfeited a Bond called *Statute-Staple*.

STAYS in a Ship, are Ropes whose use is to keep the Mast from falling aft: All Masts, Top-Masts, and Flag-Staves have Stays, except the Sprit-sail Top-Mast; the Stay of the Main-mast, which is called the *Main-stay*, is by a Lannier fasten'd to a Collar, which comes about a Knee belonging to the Head; the *Main-top-mast Stay* is fasten'd to the Head of the Fore-mast, by a Strap and a dead Man's Eye, and so is the *Main-top-gallant-mast* stay'd to the Head of the Fore-top-mast; the Fore-mast and Masts belonging to it, are in the same manner stay'd to the Bolt-sprit and Sprit-sail Top-sail Mast, which Stays do likewise stay the Bolt-sprit itself. The *Misfen-stay* comes to the Main-mast by the Half-deck, and the Top-mast Stays come to the Shrouds with Crows-feet. The length of the Stay is the same with that of the Mast it belongs to.

The Main-mast, Fore-mast, with the Masts belonging to them, have also *Back-stays*; which help to keep the Mast from pitching forward, or overboard, because they go on either side of the Ship; To bring a Ship upon the

STAYES, or to *stay her*, is in order to her Tacking, which is thus done: At the same time bear up the Helm, let fly the Fore-sail Shear, let go the Fore-bowling, Brace the Weather-brace of the Fore-sail; the same is also done to the Top-sail and Top-gallant-sail, only their Shears must be kept fast. If the Sprit-sail be out, then at the same time let go the Sprit-sail Shear also, with the Fore-theet, and brace the Weather-brace: But the Tacks, Shears, Bracings, and Bowlings, of the Main-sail, Main-top-sail, and Misfen are not altered. And when the Wind comes in at the Bow, which before was the Lee-bow, it drives all the Sails backward against the Shrouds and Masts, so that the Ship makes no way forward, but drives with her Broad-side. Those are reckoned the best Ships which will stay with the fewest Sails.

STEADY, a Word of Command at Sea, from him that Comms to the Man at Helm, to keep the Ship steady in her Course, and not to make Angles or Yaws (as they call them) in or out.

STATOCELE, is a Rupure or Tumor in the Scrotum of a fatty or Suet-like Consistence. *Blanchard.*

STEATOMA is a preternatural Swelling which consists of a Matter almost like Suet of the same Colour throughout, soft; and tho' not easily yielding to the Touch, yet suddenly returns, the Fingers being removed, to its proper Shape and Bigness.

STEEL, is made, according to Mr. Lemery, p. 154, by stratifying of Plates of Iron in a large Furnace, with the Horns or Nails, of Animals, under which is made a very great Fire: Thus is the Iron calcined; but when red Hot, and near Melting, they take the Plates out and dip them suddenly in cold Water, and so they become Steel.

Steel is not so good as Iron for Medicinal Operation, because the volatile Parts are mostly purged away in the Calcination, and what remains is hardly dissolvable by the Juice in the Body.

STEER: To steer a Ship, is to guide or govern her by the Helm. He is the best Steersman that uses the least Motion in putting the Helm over to and again, and that keeps the Ship best from making

making Yaws; that is, from running in and out. There are three ways to Steer by.

1. By any Mark on the Land, so as to keep the Ship even by it.

2. By the Compass, which is to keep the Ship's Head upon such a Rhumb or Point of the Compass, as best leads to her desired Port.

3. To Steer as one is bidden or conned, which is the Duty (in a great Ship) of him that is taking his Turn at Helm.

STEERAGE, a Part of a Ship where he standeth that *Steereth*; that is, guides the *Helm* or *Rudder* of the Ship; and this in a Man of War is always before the Bulk-head of the great Cabin; and where-ever the *Steersman* be placed, he must stand so, as that he can see the *Leach* of the Sails, whether they be in the Wind or not.

STEEVE; the Seamen say that the *Bow-sprit* or the *Beak-head* of the Ship doth *Steeve*, when either stands too upright, and not straight enough forwards.

STEGANOGRAPHY, is the Art of secret Writing, which is known only to the Persons corresponding with one another; and which if the Letters should be opened, no one is supposed to be able to discover, or *Decypher*, as 'tis called. Thow now-a-days hardly any thing, can be written by this Art, but what may be decyphered, and the Sense and Meaning of it discovered. And in this Art of *Decyphering*, that Excellent Mathematician *Dr. Wallis*, is admirably ready.

STEGNOSIS, is a Constriction or stopping up of the Pores.

STEGNOTICA. See *Astringentia*.

STELLATE Plants, are by the Botanists call'd such Plants as have their Leaves growing on the Stalks at certain Intervals or Distances, in the form of a Radiant Star; and according to *Mr. Ray*, this is the Tenth Genus of English Plants: Of this kind is *Cruciata* or Cross-wort, *Mollugo*, *Wild-madder*, *Asterula* or *Woodruff*, *Galium* or *Ladies Bed-straw*, *Aparine* or *Cleavers*, *Rubia Tinctorum* or *Dyers Madder*. To which he adds, as a-kin to this Genus, the *Nasturtium Indicum*, Indian Cress, or yellow Lark-spur.

STEM of a Ship, is that main piece of Timber which comes bowing or bending from the Keel below where it is *scarfed*, (as they call it) that is, pieced in, right before the Fore-castle; this Stem it is which guides the Rake of the Ship; and all the But-ends of the Planks (forwards) are fix'd into it. This in the Section of a First-Rate Ship, is called the *Main-stem*.

STENTOROPHONICK-Tube, or Instrument, is the Speaking-Trumpet, invented by *Sir Samuel Moreland*.

STEP, that piece of Timber in a Ship whereon the Masts or Captains do stand at bottom, is called the Step of the Mast or Captain.

STERCOROSUS Fluxus, is that in which much liquid Excrement is often voided, proceeding from excrementitious Meats corrupted in the Stomach, or a great Quantity of Excrements heaped up in the Intestines. *Blanchard*.

STEREOBATA, in Architecture, is the Greek Word for the first beginning of the Wall of any Building, and immediately standing on the Foun-

dation: This is wrongly confounded with *Seyfobata*, which is the beginning of a Column, or its *Podestal*.

STEREOGRAPHY, is the Art of drawing the Forms of Solids upon a Plane.

STEREOGRAPHICK Projection. See *Projection of the Sphere in Plano*.

STEREOMETRY, is the Art of measuring all sorts of solid Bodies, which how to do, you will find under the proper Names of each Body.

STERN of a Ship, is all the hindmost or aftermost Part of her, generally speaking: But properly, 'tis only the outmost Part of her, Aft.

STERNFAST, is some fastnings of Ropes, &c. behind the Stern of a Ship, to which a Cable or Hawser may be brought or fixed, in order to hold her Stern to a Wharf, &c.

STERNPOST, is a great Timber let into the Keel at the Stern of a Ship, somewhat sloping, into which are fastned the After-Planks; and on this Post, by its Pintle and Gudgeons hangs the Rudder.

STERNOHYOIDES, is that Pair of Muscles which is commonly by Anatomists said to arise from the uppermost part of the Breast-Bone: But this is since proved a Mistake, for they arise from the internal Part of the *Clavicula*, next where its Origination is broad and fleshy, and ascends directly over the *Sternothyroides* and *Larynx*, of an equal Breadth and Thickness, to its Insertion at the Basis of the Fore-Bone of the *Os Hyoides*. This with its Partner acting, pulls the *Os Hyoides*, together with the Tongue and *Larynx*, directly downwards.

STERNOTHYROIDES, is a pair of Muscles which do arise broad and fleshy from the upper and internal Part of the *Sternum*, whence ascending on the sides of the Wind-pipe, over the *Glandula Thyroidea*, its inserted to the inferior Part of the Thyroidal or Scutiform Cartilage.

This, with its Partner, pulls the *Larynx* downward, and lengthens the *Canalis* or distance between the *Rimula* and Tip of the Tongue, (which latter seems to be the true *Plethrum Vochi*) whereby the Tone of the Voice is rendered grave.

STERNUM Os, the Breast-Bone is joyned to the Ribs in the foremost part of the Breast, consisting of 3 or 4 Bones, and frequently in those that are come to ripeness of Age, grows into one Bone; to this is joyned in the lower part of it, the *Cartilago Ensiformis*.

STERNUTATION, Sneezing, is a forcible driving out of the Head some sharp Matter which vellicates and disturbs the Nerves and Fibres: Or, as some say, 'tis an involuntary Motion of the Brain, which contracts the Muscles of the Thorax and Abdomen, to the intent that the Matter which vellicates the Nostrils and Brain may be driven out.

STERNUTATORIUM, *sive Sternutamentum*, a sneezing Medicine or Snuff.

STEWARD of a Ship, is he that receives all the Victuals from the Purser; and he is to see in well stowed in the Hold; in his Custody are all things of that Nature belonging to the Ship's use. He is to look after the Bread, and to distribute out the several Messes of Victuals in the Ship. He hath an Apartment for himself in the Hold, which is called the Steward's Room, where he sleeps and eats.

STILE, in Dialling, is the Gnomon or Cock of a *Dial*, that casts the Shadow upon the Hour-Lines; and is always parallel to the Axis of the Earth, in all kinds of Dials.

STILLATITIOUS Oils, in Chymistry, are such as are Extracted out of Mixts, by the Force of Fire; and hereby are distinguished from such as are made by *Expression*, or by pressing.

STILLICIDIUM Urine. See *Stranguria*.

STIRRUP of a Ship, is a piece of Timber put upon a Ship's *Keel*, when some of her *Keel* happens to be beaten off, and they can't come conveniently to put or fit in a new piece; then they patch in a piece of Timber, and bind it on with an Iron which goes under the Ship's *Keel*, and comes up on each side of the Ship, where 'tis nailed strongly with Spikes; and this they call a *Stirrup*.

STROAKED, when in a Ship the Water in the Bottom can't come to the Well of the Pump, they say, *The Ship is a-stroak*, or *stroaked*: So they say also, *The Limber-holes are stroaked*, when the Water cannot pass through them; and that the Pump is *stroaked*, when something is got into it which chokes it up, so that it will not work.

STOCKS; so the Ship-Carpenters call a Frame of Timber, and great Posts made a-shore to build Pinnaces, Ketches, Boats, and such small Craft, and sometimes small Frigats: Hence we say, a Ship is on the *Stocks*, when she is a building.

STOLONES, are the *Suckers* which spring up from the Root of any Tree or Plant; and which, if not cut off, will hinder the Thriving of the Tree.

STOMACHUS, in Anatomy, is not the Stomach of an Animal, for that is called *Ventriculus*; but is properly the left or upper Orifice of the Ventricle, or Stomach, by which Meats are received into it. To this part descend Nerves from the eighth Pair and intercostal Nerves, and are mixed and interwoven with one another. The Greeks call it *xaphia*, the Heart: Whence it is that a Pain which is sometimes felt in this part, is corruptly called the *Heart-burn*; and the Region of the Stomach hereabout is called also *Scrobiculus Cordis*, or the *Heart-Pit*. It hath its Fibres Orbicular, that its Orifice may exactly shut or close upon the Meat and Drink received into the Stomach, to prevent Fumes coming up from thence to affect the Head, and to hinder Concoction.

STONES, are such kind of Minerals as are hard and friable: To which also Bishop *Wilkins* annexes

Earthly Concretions, as being of a middle Nature between Stones and Metals, but are more soft usually and brittle than the former. And that Great Man distinguishes Stones into

1. *Vulgar*, and of no Price.
2. *Middle-priced*.
3. *Precious*: And these are of two kinds, either more or less Transparent.

1. *Vulgar Stones*, or such as are, of little or no price are distinguishable from their different Magnitudes, Uses, Consistences, into the

Greater Magnitudes of Stone; used either about

- { *Buildings*; whether of
 - { *Walls*; chiefly being of a
 - { *Softer Consistence*, whether Natural, or Factitious.
 - 1 { *Free-stone*,
 - { *Brick*.
 - { *Harder Consistence*; not easily yielding to the Tool of the Workman, growing either in
 - { *Greater Masses*.
 - 2 *Ragg*.
 - { *Lesser Masses*; whether such as are for their Figure
 - { *More Knobbed and Unequal*, used for the striking of Fire; either the more common, which is less heavy; or the less common, which is more heavy, as having something in it of a Metaline Mixture.
 - 3 { *Flint*.
 - { *Marchasite*, *Firestone*.
 - { *More Round and Even*.
 - 4 *Pebble*.
 - { *Roof or Pavement*, being of a laminated Figure, either natural or Factitious.
 - 5 { *Slate*.
 - { *Tile*.
- { *Metals*, either for the

Sharpening or trying of them

- 6 { *Whet-stone*.
 - { *Touch-stone*.
- Polishing or cutting of 'em*; being either of a more spongy and soft, or of a more hard Consistence.
- 7 { *Pumice*.
 - { *Emery*.
- Lesser Magnitudes*, either more or less minute.
- 8 { *Sand*.
 - { *Gravel*.

2. *Middle-priced Stones*, are either of a

- { *Shining Politur'd*, or capable of it; whether of a
 - { *Simple white Colour*, and more soft consistence
 - 1 *Alabaster*;
 - { Sometimes *White*, sometimes *Black*, or *Green*, and sometimes *Variegated* with Veins, growing in greater or lesser Masses.
 - 2 { *Marble*, *Porphyrie*,
 - { *Agai*.
 - { *Spotted with Red upon a Greenish Colour*, or with Spots of Gold-colour upon Blue.
 - 3 { *Jaspis*, *Heliotrope*.
 - { *Lazul*, *Azure-stone*.
 - { *Transparency*, either
 - { *Brittle*; whether Natural or Factitious.
 - { *Chrystal-ine*.
 - 4 { *Glass*.
 - { *Fissil*, into Flakes, either greater or lesser.
 - { *Selenite*, *Muscovia-glass*, *Ising-glass*,
 - 5 { *Talk*. (Spar.)
 - { *Relation to Metals*, attracting Iron, or making of Bras.
 - 6 { *Lead-stone*.
 - { *Cadmia*, *Calaminaris*.
- Incombustible Nature*.

7 *Amiantus.*

Strange Original; not being properly Minerals, tho' usually reckoned amongst them; but either a *Sub-marine Plant*, or supposed to proceed from a *Liquid Bitumen*.

8 { *Coral-ine.*
Amber.

There are several other stony Consistences mentioned in the Authors who Write *de Lapidibus*. Some that are found in the Bodies of Animals, their Stomachs, Guts, Bladders, Kidneys, &c. several of which are *Denominated* from the *Animals* in which they are found; as *Alektorius*, *Chelidonius*, *Bezoar*, &c. Others have peculiar Names from their *Shapes*; as *Astroides*, *Glossopetra*, &c. Others made of *Animals*, or Parts of *Animals* petrefy'd, which may be sufficiently express'd, without being particularly provided for in the *Tables*.

3. *Precious Stones, Gems, Jewels*, are such as for their Variety and Beauty are every where more esteem'd. Amongst which, some are *less Transparent*, which are distinguishable chiefly by their Colours, either,

Representing Variety of Colours, with Dimness less or more.

1 *OPAL.*

1 *CATS-EYES.*

Of Particular Colours.

Whitish and shining; tho' this be not properly a Mineral, but a part of a testaceous Fish.

2 *Pearl.*

Red.

3 *Sardius*, Cornelian, Blood-stone.

Pale, Fleisly Colour, like that of a Man's Nail.

4 *Onyx.*

Bluish.

5 *Turcois.*

Pale Purple.

6 *Chalcedony.*

As for that which is commonly stil'd a *Toad-stone*, that is properly a Tooth of the Fish called *Lupus Marinus*, as hath been made evident to the Royal Society, by that Learned and Inquisitive Person, Dr. *Merrit*.

4. *More Transparent Gems*, may be distinguish'd into such as are either,

Colourless; either most hard and bright, or that which is very like to this in other respects, but only less hard and bright.

1 { *Diamond*, Adamant.

1 { *Sapphire white.*

Coloured; to be rang'd according to the Colours in the Rainbow.

Red; of a Lustre greater or less.

2 { *Ruby*, Carbuncle.

2 { *Garnet.*

Yellow; whether paler or deeper.

3 { *Chrysolite.*

3 { *Topaz.*

Green; either most bright and pleasant, or of a darker kind of Sea-green.

4 { *Emerald*, Smaragd.

4 { *Beryl.*

Bluish.

5 *Sapphire.*

Purple, or *Violaceous*; more inclining to Blue, or to Yellow.

6 { *Amethyst.*

6 { *Hyacinth.*

3. Such *Earthy Concretions* as commonly grow in Mines, together with such other factitious Substances as have some Analogy to these, and are *dissolvable* by Fire or Water, may be distinguish'd by their being

Not Inflammable;

More Simple; being several kinds of Salts, whether of the

Sea-water, the most necessary Condiment for Meat; or of the Air, used as a chief Ingredient in the making of Gun-powder.

1 { *Salt.*

1 { *Nitre*, Salt-petre.

Earth; of a Styptick Quality, and Absterfiv, proper for the drying of Wounds, commonly boild up in a Consistence from a *Mineral Water*; or that other kind of Earthy Salt dug up in great Lumps.

2 { *Alume.*

2 { *Sal Gemme.*

Metals of all kinds; sometimes call'd Sugars and Crystals, but agreeing in the common Nature with that which is stil'd

3 *Vitriol*, Chalcantus, Copperas.

Vegetables, made either by Fermentation, or by Burning.

4 { *Tartar.*

4 { *Alcali.*

Animal Substances, made by Distillation, call'd,

5 *Urinous Salt.*

More mix'd of other Salts; more Volatile, or Fixed.

6 { *Sal-Armoniac.*

6 { *Chrysocolia*, Borax.

Inflammable; of a more

Dry Consistence, and yellowish Colour.

7 *Sulphur*, Brimstone.

Clammy and tenacious Consistence.

Not sweet-scented; more Solid, or more Liquid.

8 { *Bitumen.*

8 { *Naphtha.*

Sweet-scented.

9 *Ambergris.*

6. *Earthy Concretions not Dissolvable*, may be distinguish'd by their various Colours; being either

White and soft, according to degrees, more or less.

1 { *Chalk.*

1 { *Marle.*

Yellowish Red, whether more Yellow, or more Red.

2 { *Oker*, Yellow Oker.

2 { *Red Oker*, Ruddle.

Black; of a finer or coarser Grain.

3 { *Fett.*

3 { *Pit-coal*, Sea-coal.

Gold-colour, of a poisonous Nature, either as it is dug out of the Earth, or as it is sublim'd.

4 { *Orpiment*, Auripigmentum.

4 { *Arsenick*, Rats-bane.

Reddish; often found in the same Mines with Orpiment.

5 *Sandarach.*

STOPPER,

STOPPER, is a piece of Rope (in a Ship) having a *Wale-knot* at one end, with a *Lannier* spliced into it, and at the other end 'tis made fast in the place where 'tis to be used. Its use is to stop the main Halliards, or the Cable. The Stopper for the Halliards is fastened at the Main-Knight, and it serves when they are Hoisting the Main-yard to stop it, while the Men that hale may stay and rest a little. But 'tis chiefly used for the Cable, to stop it, that it don't run out too fast: They bind the *Wale-knot* about the Cable with the *Lanniers*, and that stops it, so that it cannot slip away. This Stopper is fastened to the Bottom of the Bitts by the Deck. The Word is, *Lay on the Stoppers*. And a Ship is said to *Ride by the Stoppers*, when the Cable is fastened or stayed only by them, and not *Bited*; but this is not safe Riding in a stress of Weather.

STRABISMUS, Squinting, is occasioned by the Relaxation, Contraction, Distortion, too great Length, or too great Shortness of the Muscles which move the Eye. *Blanchard*.

STRAIT, or *Streight*, in Hydrography, is a narrow Sea shut up between Lands on either side, affording a Passage from one great Sea into another; as the *Strait of Magellan*, the *Strait of Gibraltar*, &c.

STRAKE, in the Sea-Phrase, is a Seam between two Planks; as the *Garboard-strike* is the first Seam next the Keel. They say also a Ship heels *a-strike*, that is, hangs or inclines to one side, the Quantity of an whole Plank's breadth.

STRANGURY, is a difficulty of Urine, when the Urine comes away by Drops only, accompany'd with a constant Inclination of making Water.

STRAP, in a Ship, is the Rope which is spliced about any Block, and made with an Eye to fasten it any where on occasion.

STRATA. Dr. Woodward, in his Natural History of the Earth, observes (and that very truly) That the far greatest part of the Terrestrial Globe consists from its Surface downwards to the greatest Depth we ever Dig or Mine, of several *Layers* or *Strata* of different kinds of Earthy Matter lying one over another, without any regular Order. This Disposition of the Earth into these *Strata*, had been before observed by *Steno*; but the Observations and Deductions that Dr. Woodward made from them, are wholly New, very Numerous, and of great Importance.

STRATARITHMETRY, is the Art of Drawing up an Army or Battallion of Men, according to any Geometrical Figure assigned: And also of expressing the just Number of Men contained in such a Figure, as they stand in Array, either near at hand, or at a Distance.

STRATIFICATION, or *Stratum super Stratum*, as the Chymists call it, is putting different Matters *Bed upon Bed*, or one Layer upon another, in a Crucible in order to calcine a Metal or Mineral. Thus in *Cementation* (which see) there is first laid a Bed of Cement, then a Plate of Gold; then another Layer of Cement, and then another Plate of Gold; and this is done alternately, till the Crucible is full; which the Chymists would express by saying, *Stratify Gold and Cement in a Crucible*.

STREAM-Anchor, is only a small one made fast to a *Stream-Cable* for a Ship to ride by in gentle Streams, and in fair Weather, when they would only stop a Tide.

STRETCH; when at Sea they are going to

Hoise the Tard, or Hale the Sheet, they say, *Stretch forwards the Hale-Yards or Sheets*; meaning that the part which the Men are to Hale by, should be put into their Hands, in order to their Hoisting or Haling.

STRIE, with the Writers of Natural History, are the small *Hollows*, *Channels* or *Chamferings*, which are found in the Shells of Cockles, Escallops, and other Shell-Fishes.

STRIKE, a Sea-word variously used: When a Ship in a Fight, or on meeting with a Man of War, lets down or lowers her Top-sails, at least half Mast high, which they call *Striking the Top-sails* upon the Bunt, they say, *She Strikes*, meaning, the Yields or Submits, or pays her Devoir to that Man of War as she passes by. When a Ship touches Ground in shoal Water, they say also, *she Strikes*. When any Top-mast is to be taken down, the Word is, *Strike the Top-mast*: And when any thing is Let or Lowered, as they call it, down into the Hold, they call it *Striking down into the Hold*.

STRIKING-Wheel, in a Clock, is that which by some is called the *Pin-wheel*; because of the *Pins* which are placed upon the Round or Rim (which in Number are the *Quotient* of the *Pinion* divided by the *Pinion* of the *Detent-wheel*.) In 16 Days Clocks, the *first* or *great Wheel* is usually the *Pin-wheel*; but in Pieces that go 8 Days, the *second Wheel* is the *Pin-wheel* or *Striking-wheel*.

STRUCTURE, is the Combination or Result of all those Qualities or Modifications of Matter in any Natural Body, which distinguish it from others, and are what in other Words, is called the peculiar *Form* or *Texture* of it.

STRUMA. See *Scrophula*.

STUPEA, seu *Stupa*, is a piece of Linen dipt in a Liquor, and applied to the part affected.

STYLE, so the Botanists call that middle prominent part of the Flower of the Plant, which adheres to the Fruit or Seed: 'Tis usually long and slender, whence its Name of *Stylus*.

STYLE, in Dialling, is that Line whose Shadow on the Plane of the Dial, shews the true Hour-Line. This is always supposed to be a part of the Axis of the Earth, and therefore must always be so placed, as that with its two extreme Points it shall respect the two Poles of the World, and with its Upper-end, the elevated Pole. This Line is the upper Edge of the Cock, Gnomon, or Index.

STYLOBATA, in Architecture, is the Pedestal of a Column or Pillar.

STYLOBATON, or *Stylobata*, in Architecture, is the same with the Pedestal of a Column. This is sometimes taken for the Trunk of the Pedestal, between the Cornice and the Base; and then called *Truncus*, as it is also by the Name of *Abacus*.

STYLOCERATOHYOIDES, are Muscles of the *Os Hyoides*, which draws upwards the Tongue and Larynx, as also the Jaws in Deglutition, whereby the Masticated Aliment is not only compressed into the latter, (the Fauces being then dilated) but the Epiglottis is also depressed, and adequately covers the *Rimula* of the Larynx, by its Application to it; by which means the descent of the least part of the Aliment into the *Aspera Arteria* is hindred; which is a most wonderful Mechanism.

They arise from the outward Appendix of the *Os Styloforme*, and are extended to the Horns or Points of the *Os Hyoides*. The middle Tendon of the *Digastricus* of the Lower-Jaw is transmitted through it. 'Tis called also *Stylohyoidæus*.

STYLOEIDES, are Processes of Bone fashion'd backward like a Pencil fastned into the Basis of the Skull it self.

STYLOGLOSSUM, is that pair of Muscles which lift up the Tongue. They arise from the Appendix of the *Os Styloforme*, and are inserted about the middle of the Tongue.

STYLOHYOIDÆUS. See *Styloceratohyoides*.

STYLOPHARYNGÆUS, is a pair of Muscles placed at the Foot of the *Processus Styloides*, that dilate the Gullet, and draw the *Fauces* upwards. They descend from an Appendix of a Bone in fashion of a Pencil, and which reaches the Sides of the Gullet.

STYMMA, is that thick Mass which remains after the steeping of Flowers, Herbs, &c. and pressing out their Oil. *Blanchard*.

STYPTICK (Blood-stopping) the same with Astringents in the general; which see.

STYPTICK-Water of Mr. *Lemery*, is made of Colcothar, Burnt-Allum, Sugar-candy, of each half a Dram; the Urine of a Young Man and Rose-water, of each half an Ounce; Plantane-water, 2 Ounces: Mix all in a Mortar, and let it stand on the Sediment in a Viol; and when you would use it, pour off the clear Water by Inclination: 'Tis of very good Use to stop Bleeding.

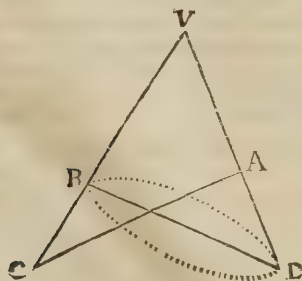
SUBALTERN Propositions, as such as differ only in Quantity, and agree in Quality; as every Triangle is Right-Angled; some Triangles are Right-Angled.

SUBCARTILAGINEUM. See *Hypocondrium*.

SUBCLAVIAN-Vessels, are the Veins and Arteries that pass under the *Clavicles*.

SUBCLAVIS, is a Muscle of the *Thorax*, which arises from the inferior part of half the *Clavicula*, next its connexion with the *Spina Scapula*; hence its Fibres descend obliquely forwards to its Insertion at the superior part of the first Rib near the *Sternum*. Its use, according to *Spigelius*, who has written a Chapter expressly about this Muscle, is to depress the *Clavicula*.

SUBCONTRARY Position, (in Geometry) is when two similar Triangles are so placed as to have one common Angle *V* at the Vertex, and yet their Bases not parallel.



And therefore if the Scalene Cone *BVD* be so cut by the Plane *CA*, as that the Angle at *C* = *D*. The Cone is then said to be cut *Subcontrarily* to

its Base *B A*. See *Spherick Geometry*, where such a Section of a Cone is demonstrated to be a Circle.

SUBCONTRARY Propositions, are such as particularly differ in Quality, and agree in Quantity; as, *some Man is a Creature, some Man is not a Creature*.

SUBCUTANEUS, a Branch of the *Basilica*, running towards the inner Condyle of the Arm. It divides into *Ramus Anterior*, and *Posterior*, which see.

SUBDUCTION, the same with *Substraction*; which see.

SUBDUPLÉ Proportion, is when any Number or Quantity is contained in another twice: Thus 3 is said to be *Subduple* of 6, as 6 is double of 3.

SUBETH Avicenna. See *Coma*.

SUBJUNCTIVE Mood (in Grammar) so called, because it has always some Condition annexed to what we affirm, and so is subjoined to, or conjoined with some other *Verb*.

SUBLUXATION, a Dislocation, or putting out of Joint.

SUBLIMATE Corrosive, is a Preparation in Chymistry, whereby Mercury is impregnated with Acids, and then sublimed up to the top of the Vessel: Thus performed.

Pour on a Pound of good running Mercury, 18 Ounces of Spirit of Nitre, set the Matrafs in Sand a little warmed, till the Mercury be all dissolved, evaporate the Dissolution in a Glass, or Earthen Pan, till all the Moisture be carried off; and then powder the remaining white Mass in a Glass-Mortar, and then mix with it a pound of Vitriol calcined white, and so much Salt decrepitated. Put this Mixture into a Matrafs, whose 2 Thirds at least remain unfilled; set the Vessel in Sand, and begin with a small Fire for three Hours, after which, that Fire must be encreased to a good strength: The Sublimate will adhere to the top of the Matrafs, and there will be a pound and three Ounces of it. The Red *Scories* at the Bottom are uselets. 'Tis a more violent Escharotick than the *Lapis Infernalis*, and inwardly taken, is one of the strongest Poisons in the World. Of this is made *Mercurius Dulcis*. The Druggists sometimes sell a sort of it that is made of *Arsenic*; but you may easily discover it by rubbing it with a little Salt of Tartar, for then it will turn Black, but if it turn Yellow, 'tis good.

SUBLIMATION, an Operation in Chymistry, whereby the finer and more *subtile* Parts of a mixt Body are separated from the rest, and carried up in the Form of a very fine Powder to the Top of the Vessel. These Powders they call *Flowers*, as *Flowers of Brimstone*, of *Benjamin*, &c. the Vessels that serve for these Uses, are called,

SUBLIMING Pots, or *Aludels*; (which Word see.)

SUBLIMIS, one of the Muscles that bend the Fingers.

SUBLINGUALES, are Glands, one on each side of the Tongue, they have two excretory Ducts (as the *Maxillares*) form'd by the Union of that of each small Gland; they run on each side of the Tongue, near its Tip, where they open into the Mouth at a little Distance from the Gums; when the *Mylohyoidæus* acteth, it compresses them.

SUBLIN-

SUBLINGUINUS, is the same with the *Epi-glottis* or *Pion*; which see.

SUBLUNARY, all things that are in the Earth, or in the Atmosphere thereof, below the Moon.

SUBMULTIPLY Number, or Quantity, is that which is contained in another Number, a certain Number of Times exactly: Thus, 3 is Submultiply of 21, as being contained in it 7 Times exactly.

SUBMULTIPLY Proportion, the Reverse of Multiply; which see.

SUBORNATION, is a secret or under-hand preparing, instructing, or bringing in a false Witness, or corrupting or alluring to do such a false Act. Hence the *Subornation of Perjury*, mention'd in the Act of General Pardon, 12 Car. 2. cap. 8. is the Alluring to Perjury.

SUBPOENA, is a Writ whereby all Persons, under the Degree of Peerage, are called into Chancery, in such Case only where the Common Law fails, and hath made no provision; so as the Party who in Equity hath Wrong, can have no ordinary Remedy by the Rules and Course of the Common Law: But Peers of the Realm, in such Cases, are called by the Lord Chancellor's, or Lork Keeper's Letters, giving notice of the Suit intended against them, and requiring them to appear.

There is also a *Subpœna ad testificandum*, for the summoning of Witnesses, as well in Chancery, as other Courts.

There is also a *Subpœna* in the Exchequer, as well in the Court of Equity there, as in the Office of Pleas.

And these Names proceed from the Words in the Writ, which charge the Party summoned, to appear at the Day and Place assign'd; *sub Pœna centum Librarum*.

SUBSCAPULARIS, or *Immerfus*, is a Muscle of the Arm, so named from its situation; by some called *Immerfus*. It is a large fleshy Muscle filling the Internal Concave, part of the *Scapula*; arising fleshy from its whole *Basis*, and *Superior* and *Inferior Costa* Internally, and marcheth forward, lessening it self according to the Dimensions of the Bone, and passing over the Junction, is inserted in a Semicircular manner to the Neck of the *Os Humeri*: When this acteth, the *Os Humeri* is pulled near the Trunk of the Body. The Tendon of this Muscle, together with the *Supra* and *Infra Spinatus*, and *Teres Minor*, unite near their Insertions, and environ the Articulation of the *Os Humeri* with the *Scapula* not unlike the *Ligamentum Catum* of the *Coxa*, to prevent frequent Luxations: And by their successive alternate acting, the Arm is moved circularly.

SUBSIDY, in Law, signifies an Aid, Tax, or Tribute granted by Parliament to the King, for the urgent Occasions of the Kingdom, to be levied of every Subject, according to the Rate of his Lands or Goods, as the Parliament shall think fit.

SUBSTANCE, is whatever subsists by it self independently from any created Being; and which is the Subject of Accidents and Qualities.

SUBSTANTIA Corticalis Cerebri. See *Corticalis Cerebri*.

SUBSTANTIVES (in Grammar) are such Words as describe the Absolute Being of a Thing, and which joined with a Verb, do make a perfect Sentence.

SUBSTYLAR Line, in Dialling, is that Line drawn on the Plane of the Dial, over which the Style stands at Right Angles with the Plane. This is always the Representation of the Meridian of that place where the Plane of the Dial is Horizontal. The Angle between the Line, and the true Meridian, is the Plane's Difference of Longitude, and is measured on the Equinoctial.

SUB-SUPER particular Proportion, is contrary to *Super-particular* Proportion; which see.

SUBTENSE, or Chord of an Arch, is a Right Line extended from one End of that Arch to the other End thereof.

SUBTERRANEOUS, or *Subterranean*, is whatever is within the Surface, Bowels, or Caverns of the Earth. Thus those Trees, which being left there at the Universal Deluge, are so plentifully found buried in the Earth, in many Countries, are called *Subterraneous Trees*, and by some, *Fossil-wood*.

SUBTRACTION, in the general, is taking a lesser Quantity from a greater, to find the Difference between them, which is commonly called the *Remainder*; as the lesser Quantity to be subtracted is called the *Subtrahend*. The General Sign or Mark of Subtraction is —

SUBTRACTION, in Algebra, or in Species, conjoins the Magnitudes propos'd, changing all the Signs of the *Subtrahend*.

Thus: If from 4 *a*, you subtract *a*, by changing the Sign of the *Subtrahend*, it will stand thus:

$$\begin{array}{r} 4a \\ -a \\ \hline X = 3a \end{array}$$

Or thus,

$$4a - a = 3a$$

And in Algebra, the Remainder, or Difference is usually noted by the Letter X, or *d*.

N. B. To subtract +, is the same as to add — and to subtract —, is all one as to add +; as is plain from the Reasons given in Addition in Algebra; which see.

Algebraick Subtraction, in Compound Quantities, will easily be performed by only observing the General Rule of changing the Signs of the Quantity to be subtracted, and then comparing the several Members together, and contracting them.

As suppose from $36b + 5mm - 7df$, you would subtract $20b + 2df + 5mm$. Write them down one under another, changing all the Signs of the *Subtrahend*; and it will stand thus.

$$\begin{array}{r} 36b + 5mm - 7df \\ -20b - 5mm - 2df \\ \hline 16b - 9df = X \end{array}$$

Which compared and contracted, will give the Difference or Remainder.

SUBTRACTION of *Indices*, is done as Algebraical Quantities are, by changing the Sign of the *Subtrahend*: Thus,

From

From 3 take $\frac{2}{1} = 5$, from 3 take $\frac{2}{1} = 5$
from 3 take $\frac{2}{1} = 1$, from 3 take $\frac{2}{1} = 1$.

SUBTRACTION of *Integers*, in *Common Arithmetick*, is performed by subcribing the lesser Number under the greater, orderly; so that Units stand under Units, Tens under Tens, &c. and then beginning at the place of Units at the Right Hand: Take the lesser from the greater, writing down the Remainder under the Line: If nothing remain, write down a Cypher, or 0. If the upper Number be in any part (for it cannot be so in the whole) lesser than the Lower, add Ten to it, or call it Ten more than it is, writing down orderly the Excess above Ten; and then be sure to carry that Ten so borrowed, to the next Figure, calling it One more than it is, and so on, as the following Examples.

	18	756	8254	567438
	15	431	6332	358784
Rent.	3	325	1922	208654

In *Subtraction*, the Number to be subtracted, together with the Difference or Remainder, are equal to the Number from which the Subtraction was made, which is a good Proof for Subtraction; as in the third Example, 6332, and the Remainder 1922, makes 8254, the first Number.

But if the Numbers be of different Denominations, then 'tis but taking the lower Denomination from that above it, and setting down the Remainder: But if any of the upper Denominations be lesser than their respective lower ones, then you must borrow one of the former Denominations next to the Left Hand, and subtract, remembering to add 1 to the next Denomination below. As in the following Examples.

l.	s.	d.	l.	s.	d.
375	11	05	1754	11	02
132	09	04	982	13	05
243	02	01	771	17	09

Here the first Example has nothing of Difficulty in it; for the Lower is in each Denomination lesser than its Upper.

In the second Example, since 5 d. cannot be taken out of 2 d. I borrow 12 d. and 'twill be 14 d. Then I say, 5 from 14 leaves 9, which I set below: Now the 12 d. I borrowed, must be added to the 13 s. on the left Hand, then 'twill be 14 s. which I subtract from 31, (borrowing 20) refts 17: Then, as in whole Numbers, 3 from 4 leaves 1, &c.

SUBTRACTION of *Logarithms*. See *Logarithms*, N. 4.

SUBTRACTION of *Vulgar Fractions*. See *Vulgar Fractions*.

SUBTRACTION of *Decimal Fractions*. See in *Decimal Fractions*.

SUBTRIPLE Proportion, is when one Number or Quantity is contained in another three times: Thus 2 is said to be *Subtriple* of 6, as 6 is *Triple* of 2.

SUCCENTURIATI *Renes*. See *Capsula attribiliaria*.

SUCCESSION of the *Signs*, is that Order in which they are usually reckoned: As first *Aries*, next *Taurus*, then *Gemini*, &c. This is otherwise called Consequence.

SUCCOTRINE Aloes, is the finest sort that comes from the Island *Succotrya*, on the Coast of *Arabia*, and from its Colour is called, *Aloes Hepatica*, or Liver-colour'd Aloes.

SUCCUS Pancreaticus. See *Ductus Pancreaticus*.

SUCULA or *Succula*, is a Term in Mechanicks for a bare Axis or Cylinder, with Staves in it to move it round, but without any Tympanum, or *Peritrochium*.

SUDAMINA, are little Pimples in the Skin, like Miller Grains; this is frequent in Children and Youths, especially those that are of a hot Temper, and use much Exercise: They break out in the Neck, Shoulders, Breast, Arms and Thighs, &c. *Blanchard*.

SUDOR, Sweat, is a watry Humour which consists of Water chiefly, with a moderate Quantity of Salt and Sulphur; this is driven through the Pores of the Skin by the Heat and Fermentation of the Blood, and sometimes by its Weakness and Colligation. *Blanchard*.

SUDORIFICKS. See *Hydroticks*.

SUFFITUS, is a thickish Powder prepared of Odoriferous Plants, Gums, &c. which thrown upon Coals produces a pleasant Smell. *Blanchard*.

SUFFOCATIO Uterina. See *Histerica passio*.

SUFFRUTEX, is a Name by the Botanists, given to a low woody Perennial Plant, sending out no Leaves from its Root, and beginning to be branched from the very Bottom of the Stalk; such as *Lavender*, *Rue*, *Sage*, &c.

SUFFUSION. See *Hypochyma* & *Cataract*.

SUGAR of Lead. See *Salt of Saturn*.

SUIT, signifies a following another, but in divers Senses.

The first, is a Suit in Law, and is divided into *Real* and *Personal*, and is all one with *Action Real* and *Personal*.

Secondly, *Suit of Court*, or *Suit-service*, is an Attend that Tenants owe to the Court of their Lord.

Thirdly, *Suit-Covenant*, is when your Ancestor hath covenanted with mine to Sue to his Court.

Fourthly, *Suit-custom*, when I and my Ancestors have been seized of their own and their Ancestors *Suit*, time out of Mind.

Fifthly, *Suit Real* or *Regal*, when Men come to the Sheriffs Turn or Leet.

Sixthly, *Suit* signifies the following one in Chace, as *Fresh-suit*.

Lastly, it signifies a Petition made to the King, or any great Person.

SUIT of the King's Peace, is pursuing a Man for Breach of the King's Peace by Treasons, Insurrections or Trespasses.

SULPHUR, the second Hypostatical Principle of the Chymists, which we call Oil. See *Oil*. The

The Constituent Character of Sulphur seems to be *Inflammability*: And there are three Kinds of Inflammable Bodies obtainable by Chymistry.

First, *An Oil*.

Secondly, *An Ardent Spirit*.

Thirdly, *A Consistent Body*, like to common Brimstone: All which are properly Sulphur.

SULPHUREOUS Spirit of Vitriol. After the Spirit and Oil of Vitriol are in Distillation of that Mineral, driven out by a most violent Fire (for 3 or 4 Days together) into the Receiver, they commonly Rectifie the Matter in a Glass-Body; and the first Spirit that rises then with a very gentle degree of Fire, is called the *Sulphureous Spirit of Vitriol*.

SULPHUR of Antimony. See *Golden Sulphur of Antimony*.

SUM, in Mathematicks, signifies the Quantity that arises or results from the Addition of two or more Magnitudes, Numbers or Quantities together; this is sometimes call'd the *Aggregate*: And in Algebra, 'tis usually denoted by the Letter *Z*, which stands for *Zuma* or *Suma*; and sometimes by the Initial Letter *S*.

SUM of an Equation, is when the absolute Number being brought over to the other side with a contrary Sign, the whole becomes equal to *O*. And this *Des Cartes* calls the *Sum of the Equation proposed*.

SUMMER Solstice. See *Solstice*.

SUMMONEAS, is a Writ Judicial of great diversity, according to the divers Cases wherein it is used, which see in the Table of the *Register Judicial*.

SUMMONS, in Common Law, is as much as *Vocatio in ius*, or *Citatio* among the *Civilians*: But how *Summons* is divided, and what Circumstances it has to be observed. See *Fleta lib. 6. Cap. 6, 7*.

SUMMONS, in *Terra perita*, is that *Summons* which is made upon the Land, which the Party (at whose Suit the *Summons* is sent forth) seeks to have.

SUMMONS ab Warrantizand, in Law, is the Process whereby the *Vouchee* is called.

SUMPTUARY Laws, were Laws made to restrain Excess in Apparel, and to prohibit costly Cloaths, of which we had formerly many in *England*, but now are all repealed.

SUN, Our Excellent Sir *Isaac Newton* saith in his *Principia*, That the Density of the Sun's Light (which is Proportional to Heat) is seven times as great in *Mercury*, as with us; and therefore our Water there would be all carried off, and boil away: For he found by Experiments of the *Thermometer*, That an Heat but 7 times as great as that of the Sun-Beams in Summer, will serve to make Water boil.

He proves also, That the Matter of the Sun to that of *Jupiter*, is nearly as 1100 to 1; and that the Distance of that Planet from the Sun, is in the same Ratio to the Sun's Semidiameter.

That the Matter of the Sun to that of *Saturn*, is as 2360 to 1; and the Distance of *Saturn* from the Sun, is in a Ratio, but a little less than that to the Sun's Semidiameter.

And consequently that the common Center of Gravity, of the Sun and *Jupiter*, is nearly in the Superficies of the Sun; of *Saturn*, and the Sun a little within it. And by the same manner of Calculation it will be found that the common Center of Gravity of all the Planets, cannot be more than

the Length of the Solar Diameter distant from the Centre of the Sun: This common Centre of Gravity he proves to be at rest; and therefore tho' the Sun by reason of the various Position of the Planets may be moved every way, yet it cannot recede far from the common Centre of Gravity. And this he thinks ought to be accounted the Centre of our World. *Book 3. Prop. 12.*

By Means of the *Solar Spots* it hath been discovered that the Sun revolves round his own Axis, without moving (considerably) out of his Place, in about 25 Days. And that the Axis of this Motion is inclined to the Ecliptick, in an Angle of 87 Degrees, 30 Minutes nearly. *Gregor. Astronom.*

The Sun's apparent Diameter being sensibly ~~shorter~~ in December than in June, as is plain and agreed from Observation, the Sun must be proportionably nearer to the Earth in Winter than in Summer; in the former of which Seasons will be the *Perihelion*, in the latter the *Aphelion*: And this is also confirmed by the Earth's moving swifter in December, than it doth in June; as it doth about $\frac{1}{4}$.

For since, as Sir *Isaac Newton* hath demonstrated by a Line drawn to the Sun, the Earth always describes equal Area's in equal Times, when ever it moves swifter, it must needs be nearer to the Sun. And for this Reason there are about 8 Days more from the Sun's Vernal Equinox to the Autumnal, than from the Autumnal to the Vernal.

According to Mr. *Cassini*, the Sun's greatest distance from the Earth is 22374, his mean Distance 2200, and his least Distance 8022, Semidiameters of the Earth.

And that the Sun's Diameter is equal to 100 Diameters of the Earth, and therefore the Body of the Sun must be 1000000 times greater than that of the Earth.

Mr. *Argon* assures us, that he observ'd by a very exact Method the Sun's Diameter to be not less than 31 Minutes, 45 Seconds in his *Apogee*, and not greater than 32 Minutes, 45 Seconds in his *Perigee*.

The mean Apparent Diameter of the Sun according to Sir *Isaac Newton*, is 32 Minutes 12 Seconds, in his *Theory of the Moon*, 32' 15".

If you divide 360 Degrees (i. e. the whole Ecliptick) by the Quantity of the Solar Year, it will Quote 59 Minutes 8 Seconds, &c. which therefore is the Quantity of the Sun's Diurnal Motion. And if this 59 Minutes, 8 Seconds be divided by 24, you have the Sun's Horary Motion, which is 2 Minutes, 28 Seconds; and if you will divide this last by 60, you will have this Motion in a Minute, &c. And this way are the Tables of the Sun's mean Motion, which you have in the Books of Astronomical Calculation, constructed.

The Sun's Horizontal Parallax, Dr. *Gregory* and Sir *Isaac Newton* makes but 10 Seconds.

The same learned Mathematician, at the end of his *Astronomiae Phys. & Geometr. Elem.* hath a Comparative Astronomy, where among the rest he considers what Phenomina would appear in the Planetary System, &c. to an Eye placed at the Sun, which are such as these:

1. That the Fixt Stars would appear in a Concave Sphere, the apparent Centre of which, is the Eye of the Spectator.

2. He would distinguish the Planets from the Fixt Stars (tho' they would appear to him to be placed among them) by their Periodical Revolutions

ons, and by the Time of those, one Planet from another: And he would judge that Planet to be farthest off, whose Periodical Revolution was the longest; and so on in order for the rest, &c.

3. To this Solar Observer's Eye, the Planets would appear always *direct*, and never *Stationary*, nor *Retrograde*, as they do to an Eye at the Earth: And they would be found to return to the same Fixt Stars again as Periods of very different lengths; and the Inferior Planets would sometimes cover the superior ones.

4. If you suppose the Eye to be moved from the Centre of the Sun to its Surface, then by the Parallax of the Planets some better guess will be had of their Distances, than by the Observation of the different Velocity and Tardity of their Motion, could before be obtained: For to the Eye thus placed the Earth's Horizontal Parallax will be 16 Minutes, equal to the Sun's Semidiameter, and consequently sensible enough. That of *Saturn* will be something above one Minute and an half, (that Planet being 10 times the Distance of the Earth from the Sun; and the Horizontal Parallax of *Mercury* will be almost 50 Minutes: And since these Parallaxes are sufficiently sensible, the Distances of the Planets may be compared with the Sun's Diameter, and with one another.

5. To an Eye thus placed all the Fixt Stars and Planets will seem to revolve from East to West, in the space of 25 of our Natural Days: The North Pole of which Revolution, will be in that part of the Heaven, which we (Inhabitants of the Earth) call the 10th Degree of *Pisces*, with 83 or 84 Degrees of North Latitude: Wherefore the Arctick Pole-Star will be at the 2d Flexure of *Draco*, and which will not be above 3 Degrees from the Pole. The South-Pole will be in 10 Degrees of *Virgo*, with 83 or 84 Degrees South Latitude, near a Star of the fourth Magnitude, which in *Cap. Halley's* Catalogue is in the first Oar of the *Argo Navis*.

6. The Planets thus seen from the Sun will appear of different Magnitudes: For the Diameter of *Saturn*, will subtend there but an Angle of 18 Seconds: That of *Jupiter* near 40 Seconds: That of *Mars* but 8 Seconds: That of *Venus* 28 Seconds: And the Diameter of *Mercury* 20 Seconds.

But Mr. *Hugens* supposes the Diameters of the superior Planets will be much larger; as making that of *Jupiter*, to subtend an Angle of almost 54 Seconds; and that of the Body of *Saturn* without his Ring 27 Seconds.

7. Of these six Planets thus moving round the Sun, three will appear attended with their Satellites: Of which the Earth will have but one, which is the Moon; and who will appear at the greatest distance, not to be from the Earth above 10 Minutes.

Jupiter will appear with his four Moons, or Satellites; of which the outermost will never appear above nine Minutes distant from the Primary Planet.

Saturn will appear with his 5 Satellites (if so many there be) and the furthestmost of them will never be above 9 Minutes distant from his Body: His Ring also will appear compassing round the Planet.

The Paths, or Orbits of these Satellites being seen from the Sun sometimes more, sometimes less Oblique, will appear accordingly now broader, now narrower Ellipses; sometimes the Planes of

these Orbits being produced, will pass thro' the Sun: In which Case, the former narrow Ellipses will pass into Right Lines; which will happen twice in every Revolution of the Orbit round the Sun, if its Plane remain always parallel to its self: Whence the Satellite will now appear to be covered by the primary Planet; and then the Planet by it; and sometimes will appear round the Planet, without its Disk, in an Ellipsis.

8. The primary Planets, as also their Satellites, have not only rough and unpolished Surfaces, but also are so disform, that they have their Spots, which are places more or less obscure, (and sometimes more bright) than the rest of their Disk: And these Spots, by the Rotation of the Planet, or Satellite, round its Axis, do describe Circles; and therefore these Ways, or Paths of the Spots, being seen from the Sun in the Plane of the Planetary Disk, will now appear Elliptical, and now straight Lines, (as before the Paths of the Satellites Disk) according as the Sun is elevated on either side, above the Plane of those Circles, or is found in it, as it is when it is in the Equinoctial of that Planet. And if there be a Series or Row, of these Spots, (as in the Belts of *Mars* and *Jupiter*): these will appear in the Form of Semi-Ellipses (the one half being behind, or on the other side the planes) or will pass into straight Lines, which will also be the Case of the outward Edge of the Ring of *Saturn*. But some of these Spots will now and then be hid, and sometimes be visible for a long time, according as they are near to the Planets Pole, which is turned from or towards the Sun.

And this will be most observable in *Saturn*, and in the Earth, in the others scarcely at all, because in them the Illustration of the Sun reaches to both their Poles.

9. Besides these six primary Planets, and their 10 Satellites, which to our Solar Observer, will all appear to move within the Bounds of a Zodiac scarce 16 Degrees broad, and not much inclined to the Circle of the first Motion, all the same way, and in Orbits nearly Concentrical to the Sun: There are also another kind of Bodies, whose Number is uncertain, which move round the Sun in very Eccentric Orbits, and which are called Comets; and which sometimes come very near the Sun, and sometimes are vastly remote from him.

These Comets do not move all in the same Track (altho' each one always keeps his own) but some one Way, and some another, and mostly in Orbits very much inclin'd to the Ecliptick, and always in great Circles of the Sphere. Their Coma or Tail (to an Eye at the Sun) will not appear oblong, or stretch'd out in length, as it doth to us, but every way diffused round the Head.

SUNARTHROSIS, is the jointing of Bones, as that of the Ribs with the *Vertebra*, &c.

SUNDAY Letter, the same with Dominical Letter.

SUPERBUS Musculus. See *Attollens Oculorum*.

SUPERCILIUM. See *Cilium*.

SUPERFICIAL Content. See *Area*.

SUPERFICIAL Numbers; the same with Plain Numbers.

SUPERFICIES, the same with Surface; (which see) is Length and Breadth only, without Thickness.

SUPER-

SUPERFOETATION, is when after one Conception another succeeds, so that both are in the Womb together: *Sennertus* makes mention of frequent Cases of this Nature.

SUPER-INSTITUTION, one Institution upon another; as where *A.* is admitted and instituted to a Benefice upon one Title, and *B.* is admitted, instituted, &c. by the Presentment of another.

SUPERONERATIONE Pasture, is a *Writ Judicial*, that lies against him who is impleaded in the County, for the over-burdening of a Common with his Cattle, in case where he was formerly impleaded for it in the County, and the Cause is removed into the King's Court at *Westminster*.

SUPERPARTICULAR Proportion, is when one Number or Quantity, contains another once, and one such Part whose Numerator is 1; then the Number so contained in the Greater, is said to be to it in *Superparticular Proportion*.

SUPERPARTIENT Proportion, is when one Number or Quantity, contains another once, and some Number of *Aliquot Parts* remaining; as, $1\frac{1}{2}$, $1\frac{1}{3}$, $1\frac{1}{4}$, &c.

SUPER Prerogativa Regis, is a Writ which lay against the King's Widow, for marrying without his Licence.

SUPER Statuto, is a Writ that lay against the King's Tenant holding in Chief, which alieneth the King's Land without his Licence.

SUPER Statuto de Articulo Cleri, is a Writ against the Sheriff, or other Officer, that distrains in the King's High-way, or in the Glebe-Lands, anciently given to Rectories.

SUPER Statuto facto pour Seneschal & Marshal de Roy, &c. is a Writ lying against the Steward, or Marshal, for holding Plea in the Court of Freehold, or for Trespas, or Contract not made within the King's Household.

SUPERLATIVE Degree, in Grammar, is when an Adjective hath joyned to its Natural and Ordinary Signification, the Word *most* or *very*, as *most Wife*, *very Good*.

SUPERPURATION. See *Hypercatarrhis*.

SUPERSCAPULARIS Superior. See *Supra-spinatus*.

SUPERSEDEAS, is a Writ in divers Cases, and signifies in general, a Command to stay, or forbear the doing of that which ought not to be done, or in appearance of Law were to be done, were it not for that whereon the Writ is granted.

Thus: A Man regularly, is to have Surety of Peace against him of whom he will swear he is afraid; and the Justice required hereunto cannot deny it him: Yet if the Party be formerly bound to the Peace, either in *Chancery*, or elsewhere, this Writ lies to stay the Justice from doing that which otherwise he ought not to deny.

SUPER Statutum Edw. 3. versus Servants & Labourers, is a Writ lying against him who keeps my Servants, departed out of any Service against Law.

SUPER Statuto de York, quo nul fera Viteller, &c. is a Writ that lies against him that uses Victualling either in Gros, or by Retail in a City, or Borough-Town, during the time he is Mayor, &c.

SUPERVISOR, signifies a Surveyor, or Overseer: It was formerly, and is still among some a Custom, especially of the better sort, to make a *Supervisor* of a Will, but it is to little purpose: However the first might be good, that he should Super-

vise the Executor, and see the Will truly performed.

SUPINATOR Radii Brevis, is a Muscle of the *Radius*, which ariseth partly Tendinous and fleshy from the Superior and external Part of the *Ulna*, next the *Radius*, and passing obliquely transverse over that Bone, is so inserted to its superior Part below the Prominence of the *Radius*, where the round Tendon of the *Biceps* endeth: It helps with the *Supinator Longus*, to move the *Radius* outwards.

SUPPEDANEA. See *Supplantalia*.

SUPINATOR Radii Longus, is a Muscle of the *Radius*, which ariseth broad and fleshy from the superior and external Part of the *Os Humeri*, three Fingers breadth below the Termination of the *Deltoides*, and descending obliquely inwards, it gradually lessens it self, and becomes a flat, broad Tendon, which likewise grows narrower till it is inserted to the external and inferior Part of the *Radius* near the *Carpus*, it helps with *Supinator Brevis*, to move the *Radius* outwards.

SUPPLANTALIA, are Plaisters applied to the Feet; these for the most part are made of Leven, Mustard, wild Radish, Salt, Soap, Gunpowder, Euphorbium, &c. they are called also *Suppedanea*.

SUPPLEMENT of an Ark, in *Geometry* or *Trigonometry*, is the Number of Degrees that it wants of being an entire Semi-circle; as Complement signifies what an Ark wants of being a Quadrant.

SUPPLICAVIT, is a Writ issuing out of the *Chancery*, for taking the Surety of Peace against a Man: It is directed to the Justices of Peace of the County, and the Sheriff, and is grounded upon the Statute, Anno 1 E. 3. Cap. 16. which ordains, That certain Persons in *Chancery* shall be assigned to take care of the Peace. This Writ was formerly called *Breve de minis*.

SUPPORTERS, in *Heraldry*, are some kind of Beasts, Birds, &c. which in an Achievement, are drawn standing on each side of, and supporting the Shield, or Escutcheon. No one under the Degree of a *Knight Banneret*, can have his Arms drawn with *Supporters*.

SUPPOSITORY, is an oblong piece of a kind of Paste, of about a Finger's length, which in some Cases is put up into the Fundament, to purge the Patient; 'tis usually compounded of Honey, Salt, purging Powders, &c. *Blanchard*.

SUPURATION. See *Abcessus*.

SUPRA Spinatus, or *Supra Scapularis*, is a Muscle so called, because it is placed above the Spine of the Shoulder-blade: It ariseth fleshy from the superior part of the *Basis Scapulae*, that is above its Spine; as also from the said Spine and *Costa superior* of the *Scapula*; from thence passing between the *Processus Coracoidei*, and *Anchoreformis*, it grows less, and becoming Tendinous, marches over the Articulations of the *Humerus*, joining its Tendons with the *Infra-spinatus*, is inserted to the Head of the *Os Humeri*. The proper Use of this Muscle, is to lift the Arm upwards towards the Occiput.

SURA, the same with *Os Fibulae*.

SURALIS, is a Branch of the *Vena Cruialis*, it divides into two Branches, the one External, and the other Internal, which is the biggest; and each of those Branches divide again into two more: This Vein distributes its Branches upon the *Far* of

the Leg, and makes with the Branches of the *Paplitea*, all those *Plexus* of Veins which are conspicuous on the upper Part of the Foot.

SURAL Vein, is a Vein which runs down on the Calf of the Leg,

SUR cui in Vita, is a Writ that lies for the Heir of that Woman, whose Husband has alienated her Land in Fee, and she brings not the Writ *Cui in Vita*, for the Recovery of her own Land: In this Case her Heir may have this Writ against the Tenant after her Decease.

SURD Roots, or Numbers.

When any Number or Quantity, hath its Root proposed to be Extracted, and yet is not a *true Figure Number of that kind*: That is, if its Square Root being demanded, it is not a *true Square*: If its Cube Root being required, it self be not a *true Cube*, &c. Then 'tis impossible to assign, either in whole Numbers or Fractions, any exact Root of such Number proposed. And whenever this happens, 'tis usual in Mathematicks to mark the required Root of such Numbers or Quantities, by prefixing before it the proper Mark of Radicality, which is $\sqrt{\quad}$: Thus $\sqrt{\quad}$: 2 signifies the Square Root

of 2, and $\sqrt[3]{\quad}$: 16. or $\sqrt{\quad}$: (3) 16. signifies, the Cubick Root of 16: Which Roots, because they are impossible to be expressed in Numbers exactly (for no effable Number, either Integer or Fraction multiplied into it self can ever produce 2; or being multiplied Cubically can ever produce 16) are very properly call'd *Surd Roots*.

There is also another way of *Notation* now much in Use, whereby Roots are expressed, without the Radical Sign, by their *Indexes*: Thus, as x^2 . x^3 . &c. signify the Square, Cube, and 5th Power of x ; so $x^{\frac{1}{2}}$. $x^{\frac{1}{3}}$. &c. signify the Square Root, Cube Root, &c. of x . The Reason of which is plain enough, for since $\sqrt{\quad}$: x is a Geometrical mean Proportional between 1. and x . So $\frac{1}{2}$ is an Arithmetical mean Proportional between 0 and 1. and therefore as 2 is the Index of the Square of x , $\frac{1}{2}$ will be the proper Index of its Square Root, &c.

Observe also, that for Convenience or Brevity-sake, Quantities or Numbers which are not *Surds*, are often expressed in the Form of *Surd Roots*,

Thus $\sqrt{\quad}$: 4 $\sqrt{\quad}$: 27, &c. signifie, 2, $\frac{3}{2}$ 3,

&c.

But altho' these *Surd Roots* (when truly such) are inexpressible in Numbers, they are yet capable of Arithmetical Operations (such as Addition, Subtraction, Multiplication, Division, &c. which how readily to perform the Algebraist ought not to be Ignorant.

Surds are either *Simple*, which are expressed by one single Term; or else *Compound*, which are formed by the Addition or Subtraction of simple *Surds*: As $\sqrt{\quad}$: 5 + $\sqrt{\quad}$: 2: $\sqrt{\quad}$: 5 - $\sqrt{\quad}$: 2. or $\sqrt{\quad}$: 7 + $\sqrt{\quad}$: 2: Which last is called, an *Universal Root*: And signifies the Cubick Root of that Number, which is the Result of adding 7 to the Square Root of 2.

The Arithmetick of Surds consists of these principal Parts.

I. To reduce Rational Quantities to the Form of any Surd Roots assigned:

Which is perform'd by Involving the Rational Quantity according to the Index of the Power of the Surd, and then prefixing before it the Radical Sign of the Surd proposed.

Thus to reduce $a = 10$ to the Form of $\sqrt{\quad}$: 15. = $\sqrt{\quad}$: b . you must square $a = 10$; and prefixing the Sign, it will stand thus, $\sqrt{\quad}$: $a a = \sqrt{\quad}$: 100. which is in the Form of the Surd desired. So al-

so if 3. were to be brought to the Form of $\sqrt[4]{\quad}$: 12, you must raise 3 up to its fourth Power, and then prefixing the Note of Radicality to it, it will be $\sqrt[4]{\quad}$: 81. or $81^{\frac{1}{4}}$, which is in the same Form with $\sqrt[4]{\quad}$: 12.

And this way may a simple Surd Fraction, whose Radical Sign refers only to one of its Terms, be changed into another, which shall respect both Numerator and Denominator. Thus, $\frac{\sqrt{\quad} : 2}{5}$ is re-

duced to $\sqrt{\quad}$: $\frac{2}{25}$ and $\frac{5}{3}$ to $\sqrt[3]{\quad}$: $\frac{125}{4}$: Where the Radical Sign affects both Numerator and Denominator alike.

II. To reduce Simple Surds, having different Radical Signs, (which are called Heterogeneous Surds, to others that may have one common Radical Sign, or which are Homogeneous.

Divide the Indexes of the Powers of the Surds by their greatest common Divisor, and set the Quotients under the Dividends; then multiply those Indexes cross-ways by each others Quotients, and before the Products, set the common Radical Sign $\sqrt{\quad}$: with its proper Index: Then Involve the Powers of the given Roots Alternately, according to the Index of each others Quotient, and before those Products, prefix the common Radical Sign before found.

To Reduce $\sqrt{\quad}$: $a a$ and $\sqrt[4]{\quad}$: $b b$

2) $\sqrt{\quad}$: $a a$ 2) $\sqrt[4]{\quad}$: $b b$

X

$\sqrt{\quad}$: $b b$ $\sqrt[4]{\quad}$: $a a a a$

To Reduce $\sqrt{\quad}$: 5 and $\sqrt[4]{\quad}$: 7

$\sqrt{\quad}$: 5 $\sqrt[4]{\quad}$: 7

X

$\sqrt{\quad}$: 25 $\sqrt[4]{\quad}$: 2401

III. To reduce Surds to the lowest Terms possible.

Divide the Surd by the greatest Square, Cube, Biquadrate, &c. or any other higher Power, which you can discover is contained in it, and will measure it without any Remainder, and then prefix the Root of that Power before the Quotient, or Surd so divided, and this will produce a new Surd of the same Value with the former, but in more simple Terms. Thus, $\sqrt{16 a a b}$, by dividing by $16 a a$ and prefixing the Root $4 a$, will be reduced to this $4 a \sqrt{b}$ and $\sqrt{12}$, will be depressed to $2 \sqrt{3}$. Also $\sqrt[3]{c b^2 r}$, will be brought down to $b \sqrt[3]{c r}$. And this Reduction is of great Use whenever it can be performed: But if no such Square, Cube, Biquadrate, &c. can be found for a Divisor, then you must find out all the Divisors of the Power of the Surd propos'd; and then see whether any of them be a Square, Cube, &c. or such a Power as the Radical Sign denotes; and if any such can be found, let that be used in the same manner as is above said, to free the Surd Quantity in part from the Radical Sign. Thus, if $\sqrt{288}$ be propos'd; among its Divisors will be found the Squares 4. 9. 16. 36. and 144. by which if 288 be divided, there will arise the Quotients 72. 32. 18. 8. and 2. wherefore instead of $\sqrt{288}$, you may put $2 \sqrt{72}$, or $3 \sqrt{32}$, or $4 \sqrt{18}$, or $6 \sqrt{8}$, or lastly $12 \sqrt{2}$, and the same may be done in Species.

IV. To find whether two Surd Roots given, are Commensurable or not.

Those are called *Commensurable Surds*, which are to one another as Number to Number, as one Rational Quantity to another; or which are, when reduced to their least Terms, true Figure Quantities of their own kind.

To discover therefore, whether they are such or not: If the Surds are of different kinds, (or *Heterogeneous Surds* as some call them) they must first be reduced to one kind, and then divided severally by their greatest common Measure, for if then there will come out Rational Quotients, the first Surds are *Commensurable*; but if the Quotients are Irrational, or Surd Numbers or Quantities, then the proposed Surds are *Incommensurable*.

V. gr. To Examine whether $\sqrt{12}$ and $\sqrt{3}$ are Commensurable Surds, they being Homogeneous, I divide them severally by their greatest common Divisor, which is $\sqrt{3}$; and the Quotients are $\sqrt{4}$ and $\sqrt{1}$, that is 2 and 1. Wherefore, since 2 and 1. are Rational Numbers, I say that $\sqrt{12}$ and $\sqrt{3}$ are Commensurable Surds; or are to one another as 2 to 1. which is very plain; for no doubt $12 : 3 :: 4 : 1$. and 'tis plain that as Squares are to one another, so are their Roots; wherefore $12 : 3 :: \sqrt{12} : \sqrt{3}$. that is, as $\sqrt{12} : \sqrt{3} :: 4 : 1$. or as 2 to 1.

Whenever two Surds are divided by one common Divisor, (tho' not the greatest, if their Quotients come out Rational, or are to one another as Number to Number, those Surds are certainly Commensurable.

If Fractional Surds were given, not having a common Denominator, they must first be reduced to their smallest common Denominator, and then

if their Numerators are Commensurable, you may conclude the first Surd Fractions were so.

But if either the Numerators or Denominators of two Surds, proper Fractions, or mixt Numbers in the Form of Fractions (neglecting the Radical Sign) be Powers of that kind which the Radical Sign expresses, then they will need no Reduction; For if their Numerators or Denominators are Commensurable, the whole Surd Fractions proposed are certainly so. Thus, if it were enquired whe-

ther $\sqrt{\frac{50}{16}}$ and $\sqrt{\frac{72}{25}}$ are Commensurable Surds;

because 16 and 25 are Squares, or such Powers as the Radical Sign expresses or denotes, omitting the Sign $\sqrt{}$: you need only compare the Numerators $\sqrt{50}$ and $\sqrt{72}$; which being divided by their greatest common Divisor, $\sqrt{2}$; the Quotients will be 5 and 6 (i. e. $\sqrt{25} : \sqrt{36}$) Wherefore the given Surds are Commensurable, and are

to one another, as $\frac{5}{4} \sqrt{2}$ to $\frac{6}{5} \sqrt{2}$ and consequently, by

the precedent Rule may be expressed thus, $\frac{5}{4} \sqrt{2}$:

2 and $\frac{6}{5} \sqrt{2}$:

For an Instance in Species; suppose that it were enquired whether $\sqrt{27 a a}$ and $\sqrt{12 a a}$ were Commensurable Surds; Divide each by the greatest common Divisor $\sqrt{3 a a}$: And the Quotients $\sqrt{9}$ and $\sqrt{4}$, that is, 3 and 2. are Rational Numbers; and consequently, the proposed Surds are Commensurable.

Multiplication of simple Surd Roots.

If the Surds proposed be of the same kind, Multiply them one by another, and prefix the common Radical Sign to the Product; but if the Surds are Heterogeneous, or of different kinds, they must be reduced first (according to Rule 2.) to Surds, having the same radical Sign.

Thus to multiply $\sqrt{7}$ by $\sqrt{8}$, the Product will be $\sqrt{56}$.

For since in all Multiplication, as 1. is to one Factor, so is the other to the Product; therefore here $\sqrt{7} : 1 :: \sqrt{8} : \sqrt{56}$. But if 4 Terms are Proportionable, their Squares will be so too; wherefore $1. 7. :: 8. 56$. that is, 56 is the true Square of $\sqrt{56}$ and $\sqrt{56}$ the true Root of $7 \times 8 = 56$.

Other Examples.

I. If $\sqrt{8}$ were to be multiplied into $\sqrt[3]{4}$, because they are not Homogeneous Surds, they must be reduced to such by Rule 2. and then they will stand thus, $\sqrt[6]{512} \sqrt[6]{16}$, which being multiplied into each other, and the common Radical Sign prefix'd, will make $\sqrt[6]{8193}$; and thus the $\sqrt[3]{27}$ multiplied by $\sqrt[6]{9}$ when reduced, and rightly multiplied, produces $\sqrt[6]{531441}$.

II. When a Surd is to be multiplied by a Rational Quantity, that Rational Quantity ought first to be reduced to a Surd of like Nature with the true Surd. But 'tis oftentimes convenient only to connect them together, by prefixing the Rational Quantity to the Left-hand of the Surd. As suppose $\sqrt[4]{27}$ were to be multiplied by 6, the Product may commodiously be expressed thus, $6\sqrt[4]{27}$; and so if $\sqrt[4]{9}$ were to be multiplied by 10, it will stand thus, $10\sqrt[4]{9}$.

III. And when two Rational Quantities are thus prefix'd to two Surds of the same kind, you may find the Product of them, by multiplying the Rational Part by the Rational, and the Surd Part by the Surd, then those joyned together, will be the Product required. Thus, $6\sqrt[3]{7}$ multiplied by $5\sqrt[3]{3}$ produces $30\sqrt[3]{21}$.

IV. If any Surd Root be to be multiplied into it self, or *Involved*, according to the Index of its proper Power, you need only cast away the Radical Sign, and then the Quantity, or Number remaining, is always the Square, Cube, or other Power required; and will always be Rational.

Thus the Square of $\sqrt{11}$, is 11.

The Cube of $\sqrt[3]{30}$, is 30.

Also $2\sqrt{3}$ multiplied by $8\sqrt{3}$ = 48. and $3\sqrt{5}$ multiplied by $2\sqrt{5}$ = 30.

V. And if the Index of the Power be any even compound Number greater than two, and 'tis required to square such a Surd: There need only a Radical Sign, whose Index is half the former, be prefix'd to the Quantity, instead of the former Compound one, and it is done.

V. gr. Suppose you would Square this Surd, $\sqrt[4]{12}$; because the Index 4, is compounded of 2 and 2; $\sqrt{12}$, is the true Product, or the true Square of the Surd Root $\sqrt[4]{12}$. so also the Square of $\sqrt[4]{10}$, is $\sqrt{10}$.

The Reason of which, is plain: For suppose the $\sqrt[4]{16} = 2$ were to be squared; its Square in Surds will be expressed thus, $\sqrt{16} = 4$.

But when a simple Surd Quantity, whose Radical Sign hath for its Index some Ternary Number greater than 3, as 6, 9, &c. And 'tis required to Involve this Surd Cubically. Then only prefix before the Quantity a Radical Sign, with an Index, which is one third of the former, and 'tis done.

Thus, if $\sqrt[6]{64}$, were to be Cubed, it will be $\sqrt[2]{64}$, and the Cube of $\sqrt[3]{512}$, is $\sqrt[3]{512}$, &c. also the Biquadrate of $\sqrt{5}$, is 25 (as being the Square of the Square of $\sqrt{5}$.) and the Cube of $\sqrt[6]{81}$, will be $\sqrt{81}$ or 9.

In the general, to Square, Cube, &c. any Surd Root, is only to Square or Cube the Power, retaining the same Note of Radicality; but 'tis better where it can be done, to take one half, $\frac{1}{2}$ Part, &c. of the Exponent of the Root, as is above shewn in the last particular Rules.

On the contrary, if you would extract the Square,

Cube, or other Root of any Surd, you must double or triple, &c. the Exponent of the Radicality. Thus the Square Root of $\sqrt[4]{16}$ is $\sqrt{16}$, the Square Root of $\sqrt[3]{27}$ is $\sqrt{27}$, &c.

Division of simple Surd Roots.

I. If the Surds are Similar, Homogeneous, or of the same kind, divide one Number, or Quantity, by another, and prefix the common Radical Sign to the Quotient: But if they are Heterogeneous, or not of the same kind, they must be reduced before they can be divided.

Thus, $\sqrt{9}$ $\sqrt{576}$ ($\sqrt{64} = 8$. And $\sqrt[4]{5}$ ($\sqrt[4]{35}$ ($\sqrt[4]{7}$.

The Demonstration of which General Rule, is the same as that in Multiplication; for from the Nature of Division, the Divisor is to Unity :: as the Dividend to the Quotient. Therefore in our first Instance, $\sqrt{9} : 1 :: \sqrt{576} : 24$, but as these Roots are, so will their Squares be: That is, $9 : 1 :: 576 : 64$, and that these Numbers are truly Proportional, is apparent; because the Rectangles of the Extremes and Means are equal: Wherefore, $\sqrt{9} : \sqrt{576} :: 1 : 24$, and consequently 24 is the true Quotient.

II. If any Rational Quantity to be divided by its Square Root, the Square Root will be the Quotient: For if $a b$ be divided by $\sqrt{a b}$, the Quotient must be $\sqrt{a b}$: And if 50 be divided by $\sqrt{50}$, the Quotient will also be $\sqrt{50}$. Also if any Rational Quantity be to be divided by a Surd, that Rational Quantity must first be reduced to the Form of a Surd, by Rule 1.

III. When a Surd Root having a Rational Quantity prefix'd before it, is to be divided by the Surd Part of it, the Quotient will be the Rational Quantity. Thus, if $5\sqrt{9}$, be to be divided by $\sqrt{9}$, the Quotient must be 5: As if $5\sqrt[3]{9}$ had been divided by $\sqrt[3]{9}$, the Quotient would be $\sqrt[3]{9}$.

IV. When the Dividend and Divisor are the Products of two Rational Quantities multiplied severally into one common Surd; or when they are Rational Quantities prefix'd before one common Surd; then divide the Rational Part of the Dividend, by the Rational Part of the Divisor, and what results, is the true Quotient.

Thus, if $8\sqrt{5}$ be divided by $2\sqrt{5}$, the Quotient will be 4, and if $8\sqrt[3]{7}$, be divided by $4\sqrt[3]{7}$, the Quotient will be only 2.

V. But when the Dividend and Divisor are two Rational Quantities, or Numbers prefix'd to two unequal Surds; then you must divide, not only as before, the Rational Part of the Dividend by that of the Divisor, but also the Surd Part; and those two Quotients connected together, so as the Rational Part stand on the Left-hand, are the true Quotient sought.

Thus, if $4\sqrt{15}$ were to be divided by $3\sqrt{5}$, the Quotient will be $2\sqrt{3}$ ($= \sqrt{12}$.) and if $4\sqrt[3]{12}$, were to be divided by $3\sqrt[3]{2}$, the Quotient will be $\frac{4}{3}\sqrt[3]{6}$.

Addition and Subtraction of Surd Roots.

I. When two or more Simple and Equal Surds are to be added, multiply one of them by the Number of them all, and the Product is the Sum required.

Thus, The Sum of $\sqrt{5}$, and $\sqrt{5}$, is the $\sqrt{20}$; because $\sqrt{5}$ multiplied by 2, the Number of the Surds, that is by $\sqrt{4}$, gives $\sqrt{20}$ their Sum. Also the Sum of $\sqrt[3]{7} + \sqrt[3]{7}$, $+ \sqrt[3]{7}$; because the Surds are 3 in Number, is $\sqrt[3]{189}$; because $\sqrt[3]{7}$ multiplied by 3 (i. e.) the $\sqrt[3]{27}$ of 27 makes $\sqrt{189}$.

II. But if Unequal Simple Surds of the same kind are to be added together, or if one is to be subtracted from the other, you must first try whether they are Commensurable; and if they be, that is, if when they have been divided by their greatest common Divisor, their Quotients are Rational Quantities, then you must multiply the Sum of those Rational Quantities by the said Common Divisor, and the Product will be the Sum of the Surds proposed: Or if the Difference of those Rational Quotients be multiplied by the Common Divisor, then the Product will be the Difference of the given Surds, when the less is taken from the greater.

Thus, if the Sum or Difference of these two Surds, $\sqrt{50}$, and $\sqrt{8}$, were required; because they are unequal, I try first, Whether they are Commensurable or not, by dividing each by the greatest common Divisor $\sqrt{2}$. And the Quotients are $\sqrt{25}$ and $\sqrt{4}$; that is 5 and 2, which are Rational Numbers; and therefore the Surds are Commensurable: Then their Sum 7, or their Difference 3, multiplied by the common Divisor $\sqrt{2}$, produces $7\sqrt{2}$ for the Sum, and $3\sqrt{2}$ for the Difference of the Surds required.

III. If the Commensurable Surds proposed, had been Fractions, or Mixt Numbers, reduced to the Form of Fractions; they must (if they have not one) be reduced to a common Denominator in the least Terms; and then to find out the Rational Quotients, you need only divide the two New Numerators, by their greatest common Divisor; and then you must go on as above, in *Integral Surds*.

Thus, If the Sum and Difference of $\sqrt{\frac{24}{25}}$ and

$\sqrt{\frac{2}{3}}$ were required: When reduced to a com-

mon Denominator, they will be $\sqrt{\frac{72}{75}}$ and $\sqrt{\frac{50}{75}}$ and these divided by their greatest common Divi-

for: $\sqrt{\frac{2}{75}}$ the Quotes are $\sqrt{\frac{36}{75}}$ and $\sqrt{\frac{25}{75}}$ or

$6\sqrt{\frac{2}{75}}$, and $5\sqrt{\frac{2}{75}}$, whose Sum is $\sqrt{11\frac{2}{75}}$

and their Difference $\sqrt{\frac{2}{75}}$.

IV. if the Simple Surds given to be added, or subtracted, are *Incommensurable*, then they can only (generally speaking) be added or subtracted by the Signs $+$ and $-$: For neither Sum nor Difference can be expressed by any single Root. And from this Addition or Subtraction of simple Surds only by the Signs, arises what they call a *Surd Binomial*, or *Residual Root*.

Thus, $\sqrt{6} + \sqrt{7}$, is a *Binomial Surd*, and $\sqrt{7} - \sqrt{6}$ is a *Residual Surd*.

But from Prop. 4. and 7 of Euclid's second Book; there arises a Rule which helps us to find the Sum or Difference of *Incommensurable Square Roots*: Which is this.

To or from the Sum of the Squares of the given Surd Roots, add, or subtract, their double Rect-angle, and the Square Root of the Sum, or Remainder, is the Sum or Difference sought, (e. gr.)

To find the Sum and Difference of $\sqrt{14}$, and $\sqrt{12}$, their Squares being 14 and 12, their Sum will be 26, and the Double Rectangle of $\sqrt{14}$, into $\sqrt{12}$, is $2\sqrt{168}$. Wherefore

$\sqrt{26 + 2\sqrt{168}}$ is the { Sum } re-
quired. { Difference }

Of Compound Surds.

The Arithmetick of *Compound Surds*, depends on the Rules above given about *Simple Surds*, and on the true Knowledge of the Signs $+$ and $-$ in Algebraick Addition, Subtraction, Multiplication, and Division; only some particular Directions may be given as to *Binomials* and *Residuals*: As,

I. If any *Binomial* be to be multiplied by its corresponding *Residual*, the Difference of their Squares is the true Product; and therefore will come out a Rational Quantity, as if $\sqrt{a + e}$ be multiplied by $\sqrt{a - e}$, the Product will be a Rational Quantity, viz. $aa - ee$.

II. Involution in *Binomials* and *Residuals*, is best and most easily performed by a Table of Powers: As because we see that $aa + 2ae + ee = (a + e)^2$. We may conclude, That to square any *Binomial* whatsoever, you need only add the double Rectangle of the Parts, to the Sum of the Squares of those Parts; or take the double Rectangle from that Sum, if it be a *Residual*.

III. For Division in *Compound Surds*, 'tis convenient, if not necessary, to reduce them first to some better, and when it can be done, to a Rational Form. And,

(1.) If a *Binomial*, consisting of two simple Square Roots, or of one Square Root, and a Rational Quantity, be multiplied by its corresponding *Residual*, the Product will always be a Rational Quantity.

(2.) If a *Binomial*, consisting of two Biquadratic Simple Roots, or of one such, and a Rational Quantity; if this be multiplied by its corresponding *Residual*, the Product will be a *Residual* consisting of either two Square Roots, or else of one Square

Square Root a Rational Quantity; which Residual being multiplied, as is before said, by its Binomial, it produces a Rational Quantity.

(3.) If a Trinomial, having three simple Square Roots, be multiplied by it self, with one of the Signs changed; the Product will be either a Binomial, or Residual, which being multiplied by its correspondent Residual, or Binomial, will give in the Product, a Quantity entirely Rational.

IV. If a Binomial or Residual, consisting of two Simple Cubick or Biquadratick Roots, &c. or of one Cubick or Biquadratick Root, &c. and a Rational Quantity is proposed for a Divisor; find so many continual Proportionals in the Proportion of the Parts of the Binomial or Residual proposed, as there be Unites in the Index of the Radical Sign, and such whose Radical Sign may be the same with that of the Parts of the Binomial or Residual; but conjoined in the Binomial by +, and in the Proportionals by + and - alternately; or contrarily, in the Proportionals by +, and in the Residual by + and -; the Product of the said Proportionals so connexed, multiplied into the Binomial or Residual, will be a Quantity entirely Rational. After the same manner may a Binomial or Residual, having 5 or 6, &c. for the Index of a common Radical Sign of the Roots, be reduced to a Quantity entirely Rational.

And Note, That when the Roots are of Different Kinds, they must first be reduced to a common Radical Sign.

V. If the Divisor be a Simple Quantity; divide each Part of the Dividend by the Divisor, and connect those particular Products together by their Signs; but if the Divisor be a Binomial, Trinomial, or Quadrinomial, &c. of such Kind as before is specified, reduce that given Divisor to a new Divisor that may be a Simple Rational Quantity. Reduce also the given Dividend to a new Dividend, by multiplying the former by the Quantities that were Multipliers, in reducing the given Divisor to a Rational Quantity; then divide the new Dividend by the new Divisor: But when the Divisor cannot be reduced to a Simple Rational Quantity, set the Dividend as a Numerator, over the Divisor as a Denominator.

Thus, $12 + \sqrt{7} : 63$ divided by 3, the Quotient is $4 + \sqrt{7} : 7$; and $8 - \sqrt{12}$ divided by 2, the Quotient is $4 - \sqrt{3} : 3$; $\sqrt{21} + \sqrt{15}$ divided by $\sqrt{3}$, the Quotient is $\sqrt{7} + \sqrt{5} : 3$; $\sqrt{56} + \sqrt{24}$ divided by $\sqrt{6}$, the Quotient is $\sqrt{9 \frac{2}{3}} + 2 : 3$; and $\sqrt{28} - \sqrt{14}$ divided by $\sqrt{7}$, the Quotient is $\sqrt{4} : 2$.

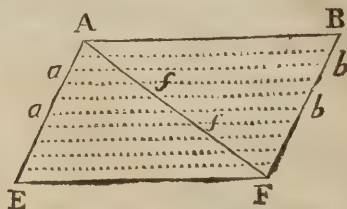
SURETY of the Peace, (so called, because the Party that was in fear, is thereby secured) is an acknowledging of a Bond to the Prince taken by a competent Judge of Record, for the Keeping of the Peace. This Peace may a Justice of the Peace command, either as a Minister, when he is commanded thereto by a higher Authority; or as a Judge, when he doth it of his own Power, derived from his Commission. Surety of the good adhering, differs from this, That whereas the Peace is not broken without an Affray, or such like; the Surety

de bono gestu may be broken by the Number of a Man's Company, or by his or their Weapon and Hardness.

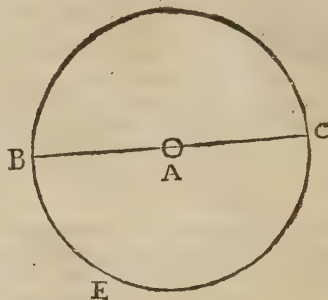
SURFACE, (the same with *Superficies*) is the bare outside of any Body; and considered by it self, is Quantity extended in Length and Breadth only, without Thickness.

There are *Plane Surfaces*, and there are *Crooked* or *Curved* ones.

A *Plane Surface* or *Superficies*, is made by the Motion of a *Right Line* always keeping in the same Plane.

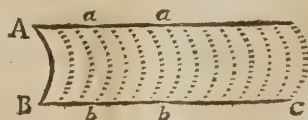


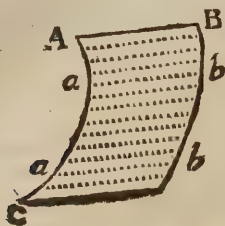
Thus, if the Line AB be conceived to move (with a Motion parallel to it self in its first situation) in the same Plane downward, and at last to stop in the Position EF, it will describe the Plane Figure or Surface ABFE, which is called a *Parallelogram*: As also the Two Plane Figures or Surfaces ABF and AEF, which are called *Triangles*.



Also, if the Right Line CA having one end as A fix'd as on a Center, be moved quite round in the same Plane, till the Point C come to C again; this Line will by its Motion describe a *Plane Figure* or *Surface*, which is called a *Circle*, as CEBA.

Curved Surfaces, are *Convex* above or without, and *Concave* below or within; You may conceive them like the *Tilt of a Boat* or *Waggon*; And such Surfaces may be generated either by the Motion of a Right Line on a Curve, or a Curve Line on a Right one, v. gr. In the Figure.





Let the Curve Line *AaaC* represent the Hoop keeping up the Cloth of a Waggon or Boat; and let the Line *AB* represent the Gunnel or the upper Edge of the Boat's-side, or the upper Rail of the Waggon. 'Tis plain that if you conceive either the Right Line *AB* to move up along the Hoop *AaaC* till it come to the Top, and then down again on the other side till it come to the Bottom, it will by its Motion describe the Figure of the Tilt or curved Surface *ABbCaaA*. And the very same Figure would be produced by the Motion of one of the Hoops or crooked Line *AaaC*, carried (in a Position parallel to it self) along the Edges of the Boat or Waggon.

SURGE, the Sailors call a Wave or Billow of the Sea a *Surge*; also when they are Heaving at the Capstan, if the Cable happen to slip back a little they say the *Cable Surges*.



SURMOUNTED. The Herald's term for Bearing of one Ordinary upon another. A *Pile* surmounted of a *Chevron*.

SURPLUSAGE, in common Law, signifies a Superfluity or Addition more than needeth, which sometimes is the cause that a Writ abateth. It is sometimes also applied to matter of Account, and denotes a greater Disbursement than the Charge of the Accountant amounteth unto.

SURREJOYNDER, is a second Defence of the Plaintiff's Action, opposite to the Defendant's *Rejoinder*.

SURRE-BUTTER, is a second *Rebutter*, or a *Rebutting* more than once.

SURRENDER, is an Instrument in Writing, testifying with apt Words, That the particular Tenant of Lands or Tenements for Life or Years, doth sufficiently consent and agree, That he which has the next or immediate Remainder or Reversion thereof, shall also have the present Estate of the same in Possession, and that he yields and gives up the same unto him; for every *Surrender* ought forthwith to give Possession of the things *surrendered*. There may be also a *Surrender* without Writing; and therefore there is said to be a *Surrender in Deed*, and a *Surrender in Law*: \odot *Surrender in Deed*, is that which is really and sensibly performed: A *Surrender in Law*, is Intendment of Law by way of Consequent, and not Actual. As if a Man have a Lease of a Farm, and during the Term he accept of a new Lease; this Act is in Law a *Surrender* of the former: There is also a

Customary Surrender of the Copyhold Land, as may be seen in *Cooke sup. Littleton*, Sect. 74.

SURROGATE, signifies one that is substituted or appointed in the room of another, most commonly of a Bishop, or of a Bishop's Chancellor.

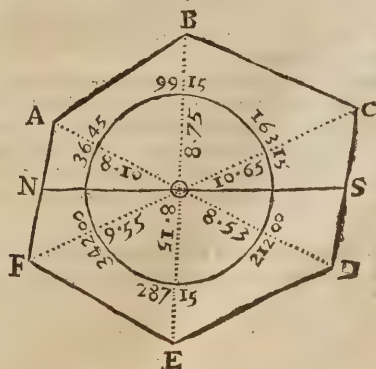
SURSOLID-Place. See *Place-solid*.

SURSOLID-Problem, in Mathematicks, is that which cannot be resolved, but by Curves of a higher Nature than a Conick-Section, *v. gr.* In order to describe a *Regular Endecagon*, or Figure of eleven Sides in a Circle, 'tis required to describe an Isosceles Triangle on a Right Line given, whose Angles at the Base shall be Quintuple to that at the Vertex, which may easily be done by the Intersection of a Quadratrix, or any other Curve of the second Gender, as they are called by some.

SURVEYING of Land, or *Planometria*, is the Art of Measuring all manner of Plain Figures, in order to know their superficial Content; which how to do Geometrically, I have shewed all along under the particular Name of each Plane Figure. But how to bring this to Practice, so as to Measure the Area's of Real Lands, Fields, Grounds, &c. by the help of proper Instruments, is what we usually call *Surveying*; and this is what is design'd to be taught under this Word. The Surveyor being furnished with a good Instrument to take Angles, as a well made Theodolite, or entire Brass Circle, with a well graduated Limb, and Telescope Sights, as also with a well divided Pole-Chain, an Off-set Rod, Station-Staves, &c. He may proceed after these or such like Methods, which a little Practice will familiarize to him.

1. To take the Plot of a Field at one Station in any Place thereof, from whence you may see all the Angles.

Suppose *ABCDEF* to be a Field, of which you are to take the Plot: Having set your Instrument in any convenient Place thereof, as at \odot ; and let Marks or Station-staves with Paper be set up in every Angle: Then set your Instrument so that the Needle hang directly over the *Meridian-Line* of the Cord, and there screw fast the Instrument.



Then direct your Sights to *A*, and you will find the Index cutting $36^{\circ} 45'$, which note down in your *Field-Book* in the second Column thereof, and measure the Distance from \odot to *A*, containing suppose

suppose 8 Chains and 10 Links, which set down also in the third Column of your *Field-Book*.

Then direct your *Sights* to B, the *Index* cutting 99 Deg. 15 Min. and the Distance from \odot to B, is 8 Chains and 75 Links, both which set down in your *Field-Book*, as before.

Do the like for the rest of the *Angles* from \odot to C, D, E, and F, and set them down, as you observe them with their Distances measured from the Station, as you see done in this following Table, which is a Copy of the *Field-Book*, and will shew you the Method how to Note down your Observations.

	D. M.	Ch. Lin.
A	36 45	8 10
B	99 15	8 75
C	163 15	10 65
D	212 00	8 53
E	287 15	8 15
F	342 00	9 55

Having thus finished your Work in the *Field*, the next Business must be to *Protract* the same; that is, to lay down a *Plot* thereof upon Paper or Parchment, which is done thus.

Draw a Line as NS, representing the *Meridian-Line*; then in part of that Line, as at \odot make a Point, representing your Place of standing in the *Field*; upon this Point place the Center of your *Protractor*, so that the Diameter thereof may be directly upon the Line NS.

Then against $36^{\circ} 45'$ on the Limb of the *Protractor*, set a Point representing the Degrees of your first observed Angle, and let the same be done with the second and third Observations.

To prick off the 4th, viz. 212. the *Protractor* must be turned downwards, because the Degrees are greater than a Semicircle. Then proceed to *protract* the rest of the Angles.

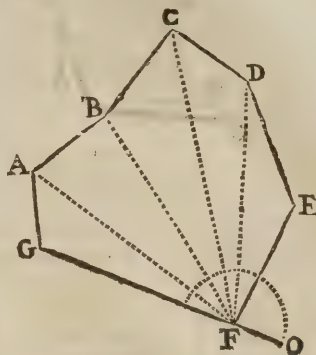
Then take away the *Protractor*, and laying a Ruler to the Station-point \odot , draw obscure Lines from thence to those Points, on which Lines set their respective Measures from your Scale; as 8 Chains 10 Links from \odot to A, and 8 Chains 75 Links from \odot to B, and so of the rest, as you have them down in your *Field-Book*.

Then connect these Points by the Lines AB, BC, CD, DE, EF, and FA, so shall you have the true Figure of the Field.

But this way obliges you to more Measuring with the Chain than is needful, and therefore is not so good for Practice in most Cases as another I shall by and by shew you; only it hath this Advantage, That you may soon know whether you have taken your Angles truly; for all about the Point $\odot = 36^{\circ}$.

2. To take the Plot of a Field at one Station, in any Angle thereof, from whence the other Angles may be seen.

Let ABCDEFG be the *Field*, and F the Angle, at which you would take your Observations.



Having placed your Instrument at F, turn it about (the North-Point of the Card from you) till through the *Sights* you espy the Mark at G; then fasten the Instrument, and move the Index till you see the Mark at A, the Deg. cut on the Limb being 20; then move it till you see B, where it cuts 40 Degrees: Do the same at C, and there it cuts 60 Degrees; likewise at D 77 Degr. and at E 100 Degr. All these Angles note down in your *Field-Book*; next with the Chain, measure all the Lines running from the Station, as from F to G 14 Chains, 66 Links, and from F to A. 18 Ch. 20 Links, and so of the rest, as you see them in this Table.

Ang.	D. M.	Ch. Lin.
G	00 00	14 60
A	20 00	18 20
B	40 00	16 80
C	60 00	23 20
D	77 00	16 95
E	100 00	8 50

To *protract* these Observations.

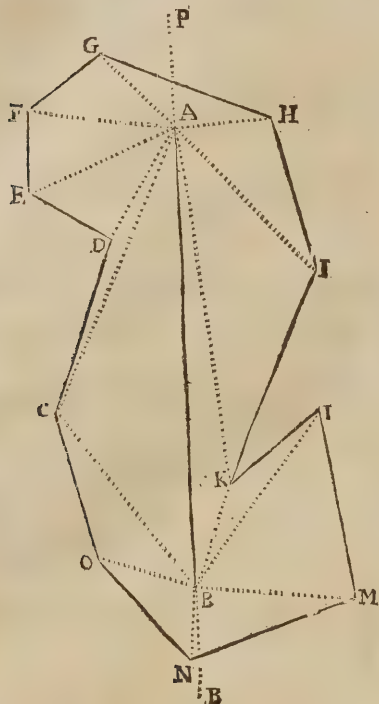
Draw a Line at pleasure as GF, upon which lay the Diameter of your *Protractor*, with the Center in F; then make Marks at every Angle round the *Protractor*, as you find them in your *Field-Book*, viz. against 20, 40, 60, 77, 100; which done, take away the *Protractor*, and draw Lines FA, FB, FC, FD, and FE, through each of these Marks; on which Lines set off the Distances by a Scale, as you find them in your *Field-Book*; and where the End of those Distances fall, let there be Lines drawn to connect them, as GA, AB, BC, CD, DE, EF, and FG, and you have your *Field* complete.

Note, That you may as well take the Plot of a Field at one Station, standing on any Side thereof, as in an Angle.

3. To take the Plot of a Field at two Stations, when the Field is so Irregular, that from one Station you cannot see all the Angles.

Let

Let C D E F G H I K L M N O be the *Field*, in which from no one Place thereof all the Angles may be seen. Therefore chuse two Places for your Stations, as A and B.



Set your Instrument at A, and look through the *Sights* towards your 2d Station B, and then fix your Instrument. And, as before taught, with the Index take all the *Angles* at that end of the *Field*, as C D E F G H I K, and measure the Distance between your Instrument and each Angle; as also the Distance between the two Stations.

Then remove your Instrument to the second Station B, and having made it fast, so as through the *Back-Sights* you may see the first Station A: Take that Angles at the end of the *Field*, as N O C K L M, and measure their Distances, as before: All which being done, your *Field-Book* will stand thus.

First Station.

	D.	M.	Ch.	Lin.
Ang.	25	00	20	75
C	31	00	8	10
D	67	00	9	85
F	101	00	10	80
G	137	00	7	00
H	262	00	6	70
I	316	00	13	70
K	354	00	24	50

The Distance between the two Stations A and B is 31 Ch. 60 Lin.

Second Station.

Ang.	D.	M.	Ch.	Lin.
N	3	30	4	20
O	111	00	7	00
C	145	00	15	60
K	205	00	8	40
L	220	00	15	00
M	274	00	11	20

To *Protract* this, draw a Right Line at adventure, as P A B B, whereon set from your Scale 31 Ch. and 60 Links (the Distance between the two Stations) making Marks with the Compasses, as A and B for your first and second Station.

Lay the *Protractor* to A, the North-end of the Diameter being towards B, and mark out the several Angles observed at your first Station, draw Lines, and set off the Distances measured.

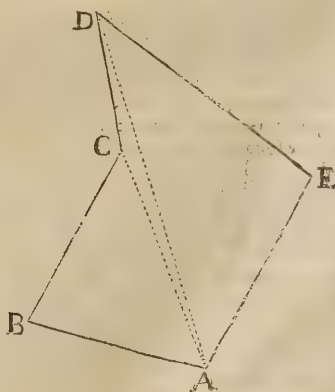
Do the same at B, the second Station; and when you have marked out all the Distances between those Marks, draw the Bound-lines.

Note, If a *Field* be very irregular, you may after the same manner make 3, 4, or 5 Stations, if you please: Tho' tis much better to go round such a Field, and measure the Bounding-Lines.

4. To take the Plot of a Field at one Station, in an Angle (so that from that Angle you may see all the other Angles) by Measuring round about the said Field.

Suppose A B C D E the *Field*, and A the Angle appointed for the Station.

Place your Instrument in A, and turn it round till you see (through the *fixed Sights*) the Mark at B; then screw it fast, and turn the Index to C; observing what Degrees are there cut on the Limb, which suppose to be 68 Degrees; turn it further;



till you see D, and Note down the Degrees there cut, viz: 76 Degrees; do the like at E, and the Index will cut 124 Degrees: This done, measure round the *Field*, Noting down the Length of the Side-Lines between Angle and Angle.

5 B

Then

Then your Field-Book will stand thus.

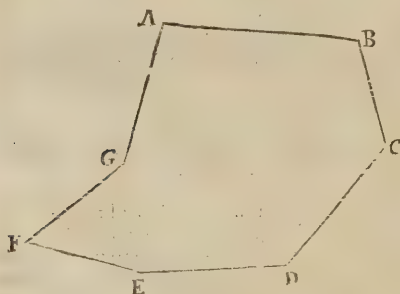
Ang.	D. M.
C	68 00
D	76 00
E	124 00

Lines	Ch. Lin.
A B	14 00
B B	15 00
C D	7 00
D E	14 40
E A	14 05

To Protract which, draw the Line A B as you please, and applying the Center of the Protractor to A, (the Diameter lying upon the Line A B) prick off the Angles, and make Marks, through which draw Lines A C, A D, and A E, in which you may find the Points C, D, E, by the Measures taken, as you have them in your *Field-Book*, and taken of a Scale; then draw the Bounding-Lines, and you have done.

5. To take the Plot of a Park Wood, a very great Common, or a large Champian Field, by going round about the same, and making Observations at every Angle thereof.

Let A B C D E F G be a large Field or Wood, through which you cannot see to take the Angles, but must be forced to go round the same.



Place your Instrument at the Angle A, and lay the Index on the Diameter thereof, moving the whole Instrument about, till through the Sights you see the second Angle at B, and there fix it: Then turn the Index about backwards till you see the Angle at G, the Index cutting 97 Degrees, which is the Quantity of the Angle G A B; Measure the Line A B, it contains 12 Chains, 5 Links, which set down in your *Field-Book*.

Then remove your Instrument to B, the Index lying upon the Diameter, turn it about till you see the Angle at C, and there fasten it; and turn the Index backwards till you see the Angle at A; then set down the Degrees cut on the Limb, and the Measure of the Line B C in your *Field-Book*.

Remove to C, D, F, and G, making your Observations after the same manner; and measuring the Length of every Line, they'll stand thus in the *Field-Book*.

	D. M.	Ch. Lin.
A	97 00	12 5
B	120 30	4 45
C	132 00	8 85
D	125 00	13 4
E	121 30	7 70
F	80 00	5 67
G	227 00	7 87

The manner of Protracting this, is nearly the same as before.

How to discover whether the Angles made at their several Stations, be truly taken or not.

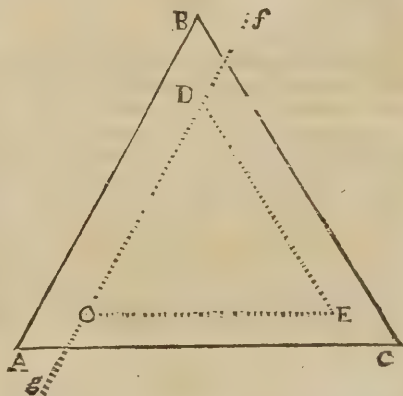
R U L E.

Multiply 180 Deg. by a Number less by 2 than the Number of Sides or Angles in your Plot, the Product shall be equal to the Sum of all the Angles observed, if you have wrought true, otherwise not.

Thus, there were seven Angles or Sides in the last Plot, therefore I multiply 180 by 5, the Product is 900, which is equal to all the Angles reckoned in the inside of the Plot: For the outward Angles are not included in the Rule.

6. To measure parallel to a Hedge (when you cannot go close along the Hedge itself) and also in such a case, how to take your Angles.

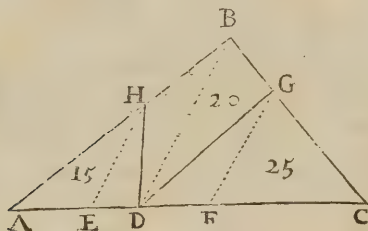
Suppose A B C to be a Field, and for the Bushes you cannot come nigher than Θ to plant your Instrument.



Then set up Marks, and with your Off-set Rod or Chain, if the Distance be large, take the Distance between the Instrument Θ , and the Hedge A B; which Distance set off again nigh B, and set up Marks at D: Likewise take the Distance between Θ and the Hedge A C, and accordingly set up Marks at E. Then take the Angle D Θ E, which will be the same as the Angle B A C: Do thus for the rest of the Angles. But when the Lines are measured, they must be measured of the same Length with the outside Lines, as the Line Θ D, measured from g to f.

ceeding from any Point assigned in any Side thereof.

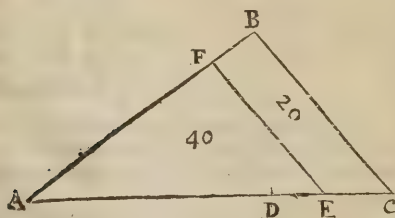
Let ABC be the Triangular piece of Land, containing 60 Acres, to be divided between three Men: The first to have 15 Acres, the second 20, and the third 25 Acres; and the Lines of Division to proceed from D.



First, measure the Base, which is 50 Chains; then divide this Base into 3 parts; thus, saying, If 60 give 50, What shall 15 give? Answer, 12 Chains 50 Links for the first Man's Base, which set from A to E. Again, say, If 60 give 50, What shall 20 give? Answer, 16 Chains 66 Links for the second Man's Base, which set off from E to F; Then the third Man's Base must be 20 Chains 84 Links, viz. from F to C. This done, draw an obscure Line from D to the opposite Angle B, and from E and F draw the Lines EH and FG, parallel to BD. Lastly, from D, draw DH and DG, which shall divide the Triangle into three such parts as were required.

10. To divide a Triangular Piece of Land, according to any Proportion given, by a Line drawn parallel to one of the Sides.

ABC is the Triangular Piece of Land, containing 60 Acres, the Base AC is 50 Chains: This Piece of Land is to be divided between two Men, by a Line drawn parallel to BC, in such Proportion, that one have 40 Acres, the other 20.

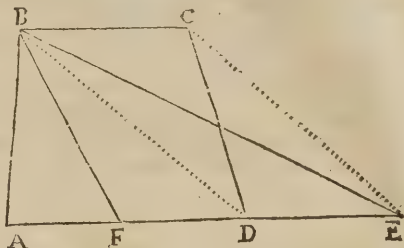


1. Divide the Base, as has been before taught, and the Point of Division shall fall in D. AD is 33 Chains 33 Links; DC 16 Chains 67 Links.

2. Find a mean Proportion between AD and AC, by multiplying the whole Base 50 by AD 33.33, the Product is 16665000, of which Sum extract the Square Root, 'twill be 40 Ch. 82 Lin. which set from A to E; then draw ET parallel to BC, so the Triangle is divided as required.

11. To reduce a Trapezia into a Triangle, by Lines drawn from any Angle thereof.

Let ABCD be the Trapezia to be reduced into a Triangle, and B the Angle assigned.



Draw the obscure Line BD, and draw CE parallel to DB, produce the Base AD to E, and draw BE, which shall make the Triangle BAE equal to the Trapezia ABCD.

Now to divide this Trapezia according to any assigned Proportion, is no more but to divide the Triangle ABE, as before taught, which will also divide the Trapezia.

Example.

Suppose the Trapezia ABCD, containing 124 Acres, 3 Rods, and 8 Perches, is to be divided between two Men; the first to have 50 Acres, 2 Rods, and 3 Perches; the other 74 Acres, 1 Rod, and 5 Perches, and the Line of Division to proceed from B.

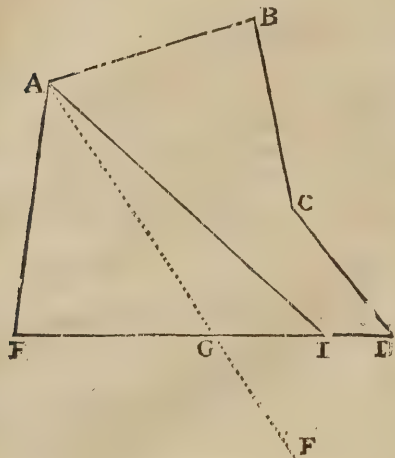
First, Reduce the Shares into Perches, and 'twill be 8083 for the first Man, and 11885 Perches for the second Man's Share.

Secondly, Measure the Base of the Triangle, viz. AE, 78 Chains 00 Links.

Then say, If 19968, the whole Content, give for its Base 78 Ch. What shall 8083, the first Man's Part, give; Answer, 31 Ch. 52 Links; which set off from A to F, draw the Line FB, so you divide the Trapezia as desired: The Triangle ABF being the first Man's Portion, and the Trapezia BCFD, the second's.

12. To divide an irregular Plot of any Number of Sides, according to any Proportion given, by a straight Line drawn through it.

As suppose the Field ABCDE contain 46 Acres to be divided in Halfs between two Men, by a Line proceeding from A.



First draw a Line at pleasure through the Figure as A F; then cast up the Content of either Half, and see what it wants, or what it is more than the true Half should be.

Thus I cast up the Content of A E G, and find it to be but 15 Acres; whereas the true Half is 23 Acres; 8 Acres being in the Part A B C D G more than in A E G; therefore I make a Triangle containing 8 Acres, and add it to A E G, as the Triangle A G I; then the Line A I parts the Figure into equal Halfs.

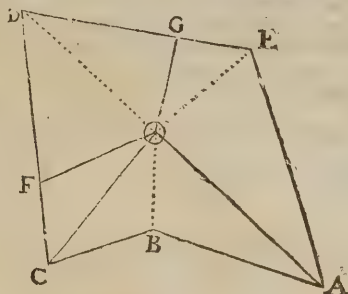
Thus you may divide any piece of Land of never so many Sides and Angles, according to any Proportion, by straight Lines drawn through it, with as much Certainty, and more expeditiously than by any other way yet known.

Another Example will make all plain.

Suppose the following Field, containing 27 Acres, is to be divided between three Men, each to have 9 Acres, and the Lines of Division to run from a Pond to a Field, so every one may have the Benefit of the Water, without going over one another's Land.

First, from the Pond \odot draw Lines to every Angle, as $\odot A$, $\odot B$, $\odot C$, $\odot D$, $\odot E$; and then the Figure is divided into 5 Triangles, each of which Measure, and put the Contents down severally; which Contents reduce into all Perches, and so will the Triangle,

$\left\{ \begin{array}{l} A \odot B \\ B \odot C \\ C \odot D \\ D \odot E \\ E \odot F \end{array} \right\}$	$\left\{ \begin{array}{l} 390 \\ 1238 \\ 911 \\ 1107 \end{array} \right\}$	Perches.
---	--	----------



The whole Content being 4320 Perches, or 27 Acres, each Man's Proportion being 1440 Perches.

From \odot to any Angle draw a Line for the Division Line, as $\odot A$: Then consider that the first Triangle A \odot B is but 674 Perches, and the second Triangle B \odot C 390, both together but 1064 Perches, less by 376 than 1440, one Man's Portion. You must therefore cut off from the third Triangle C \odot D, 376 Perches for the first Man's dividing Line, which thus you do: The Base D C is 18 Chains, the Content of the Triangle 1238; say then, If 1238 Perches give bare 18 Chains, What shall 376 Perches give? Answer, 5 Chains, 45 Links; which set from C to F, and drawing $\odot F$, you have the first Man's Part, viz. A \odot F.

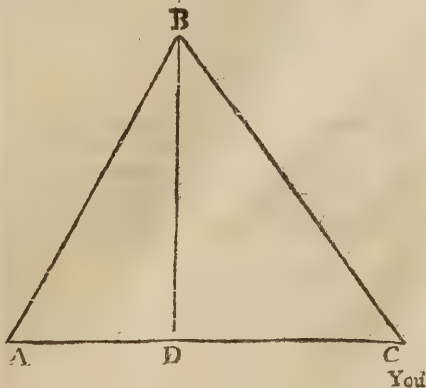
Then see what remains of the Triangle C \odot D 376, being taken out, and you'll find it to be 862 Perches, which is less by 578 than 1440.

Therefore from the Triangle D \odot E cut off 578 Perches, and the Point of Division will fall in G. Draw the Line $\odot G$, which with $\odot A$ and $\odot F$, divides the Figure into three equal Parts.

13. To take the Horizontal-Line of a Hill.

When you measure a Hill, you must measure the Superficies thereof, and accordingly cast up the Contents. But when you Plot it down, because you cannot make a Convex Superficies upon the Paper, you must only Plot the Horizontal-Line or Base thereof, which you must shadow over with the Resemblance of a Hill. That Horizontal or Base-Line is found after this manner.

Suppose A B C D a Hill, whose Base you would know.



SUR

Your Instrument being placed at A, cause a Mark to be set up at B, so high above the top of the Hill as the Instrument stands from the Ground at A; then take the Angle B A D, 58 Deg. measure the distance A B, 16 Chains, 80 Links: Then say,

As Rad. : A B :: S, B A D : A D.

S, 90°, 00' : 16 Ch. 80 Lin. :: S, 32°, 00' 8 Ch. 90 Lin.

Then remove your Instrument to B, and take the Angle C B D, 46° Deg. measure the distance B C 21 Chains; then say,

As Rad. : B C :: S, C B D : D C.

S, 90d, : 21 Ch. :: S, 46d : 15 Ch. 12 Links.

The 15, 12 added to 8, 90, makes 24 Chains 2 Links, for the whole Base A C.

Otherwise thus.

Take the Angles B A C 58 d. and A B C 78 deg. subtract these two from 180 deg. there will remain the Angle C 44 deg. measure A B, then say,

As S, C : A B :: S, B : A C.

14. To find the Content of your Field in Acres and Parts of an Acre.

Since Mr. Gunter's 4 Pole Chain, all along here used, is supposed to be divided into 100 equal Parts or Links; and that every Acre contains 160 Square Perches or Poles. Therefore 160 Perches \times into 160 Perches, = a Square Acre. But the Chain being Decimally divided, so that in one 4 Pole Chain, there are 100 Links; therefore 10 Square Chains must make an Acre; that is, an Acre will contain 10000 Links.

Suppose therefore the Base of any Triangle in my Plot were 53 Chains 53 Links, whose Area in Acres and Parts of an Acre I would find by multiplying its half Altitude 8 Chains 25 Links, into that Base or Side; work just as in Decimals, thus:

$$\begin{array}{r} \text{C. L.} \\ 27\ 53 \\ 8\ 25 \\ \hline 13765 \\ 5506 \\ 22024 \\ \hline 2271225 \end{array}$$

Only from the Product I cut off five places, (or which is all one, Divide it by 10000) there remains 22 Acres .71225. To reduce which Decimal Fraction .71225 into Roods and Perches, I consider that there are 4 Roods in an Acre; therefore I multiply by 4, and cut off 5 places as before.

SUS

$$\begin{array}{r} .71225 \\ 4 \\ \hline 284900 \end{array}$$

This gives me 2 Rod and this Fraction;

$$\begin{array}{r} 84900 \\ 40 \\ \hline 3396000 \end{array}$$

which I multiply by 40, because there are 40 Perches in a Rod, and the Product is 33 96000, from whence cutting off 5 places as before, it gives me 33. Perches. So the whole Content is 22 Acres, 2 Rod, 33 Perches. See the Word Chain.

Knowing the Content of a Piece of Land, to find what Scale it was plotted by.

First, By any Scale measure the Content of the Plot; then say,

As the Content found, is to the Square of the Scale I tried by;

So is the true Content to the Square of the true Scale it was plotted by.

As suppose there is a Plot of a piece of Land containing 10 Acres, and I measure it by the Scale of 11 in an Inch, and find it to contain 12 Acres $\frac{1}{10}$ of Acre.

Then say,

As 12 $\frac{1}{10}$: 121 (=) Sq. :: 10 : 100.

And the Square Root of 100 is 10; therefore I conclude that Plot to be made by a Scale of 10 in an Inch.

How to change Customary Measure into Statute-Measure, and the contrary.

Say, As the Square of one sort of Measure, is to the Square of the other:

So is the Content of the one, to the Content of the other.

Thus: Suppose a Field measured by a Perch of 18 Foot contain 100 Acres, How many Acres shall the same Field contain by a Perch of 16 Foot $\frac{1}{2}$?

Say, If the Square of 16 $\frac{1}{2}$ Foot, viz. 272, 25, give the Square of 18, viz. 324, What shall 100 Acres Customary give? Answer, 119 $\frac{9}{10}$ Statute-Acres.

SURVEYING-Scale, the same with Reducing-Scale.

SURVIVOR, in Law, signifies the longer Liver of two Joint-Tenants, or of any two joined in the Right of any thing.

SUSPENSION, or *Suspense*, is a Temporal stop of a Man's Right; as when a Seignory, Rent, &c. by reason of the Unity of Possession thereof, and of the Land out of which they issue, are not in esse for a time, and *tunc dormiunt*, but may be revived or awaked, and so differs from Extinguishment, which dies for ever. And sometimes this Word Suspension is used in Common Law, as it is in the Canon Law, *pro minori Excommunicatione*.

SUSPENSOR *Testiculi*, the Name of a Muscle otherwise call'd *Cremaster*; which see.

SUSPENSOKIUM, is a Ligament of the Penis first discover'd by our Accurate Mr. Cowper the Surgeon

geon. It ariseth from the Anterior Part of the *Ossa Pubis*, and fix'd to the upper part of the *Dorsum Penis*, on each side its great Vein. Its Use is to assist the *Musculi Erigentes* in their Action.

SUTURA also, is a Connexion of the Sides or Lips of a Wound. This is of two sorts: Actual, which is done with a Needle of a triangular Point, a Pipe, or Cane, and waxed Thread: First in the middle of the Wound you must sew it together with a double Thread, and having made a Knot, cut it off; the rest of the Wound must be sewed up with single Thread; Care must be taken that the Stitches are not set too wide, nor too close, especially not too close, that there may be room for any corrupt Matter bred in the Wound to work out. The other sort of Suture is much like the way that the Skinners use to sew Skins together: This is proper in Wounds of the Intestines, and in Cuts of the Veins and Arteries.

Also the *Junctures* of the Parts of the Shells of Fishes to one another, are called *Sutures*.

SUTURA Ossium, a Suture in the *Juncture* of the Bones of the Skull, like the Teeth of Saws meeting together. Those which join the Parts of the Skull to the Bones of the upper Jaw, are of 3 sorts; the *Transversalis*, the *Ethmoidalis*, and the *Sphenoidalis*; which see under those Words. The Sutures joining the parts of the Skull are 4: The *Coronalis*, *Lambdoidalis*, *Sagittalis*, and *Squamosa*; which see.

SWABBER, the Title of an inferior Officer aboard a Man of War, whose Office it is to see that the Ship be kept neat and clean; in order to which, he is to see her washed well once or twice a Week at least, especially about the Gun-walls and Chains. He ought to burn Pitch or some such thing now and then between Decks, to prevent Infection; and to acquaint the Captain of such as are Nafty and Offensive.

SWAINMOTE, or *Swainmote*, signifies a Court touching Matters of Forest, and held by the Charter of the Forest thrice in the Year, before the *Verdorsors* as Judges. And it is as incident to a Forest, as Court of Pye-powder to a Fair.

SWALLOW-Tail, in Fortification, is a *single Tenaile*, that is narrower towards the Place than towards the Country. See *Queue d'aronde*.

SWEEP. The Seamen call the Mold of a Ship when she begins to compass in at the Rungheads, the Sweep of her; or the Sweep of the Futtock.

SWEEPING, at Sea, signifies dragging along the Ground, at the Bottom of the Sea, or Channel, with a Tree-fluked Grapnel, to find some *Hawser* or *Cable*, which is slipped from an Anchor.

SWEETBREAD. See *Pancreas*.

SWIFT in Motion, a Planet is said to be so, when by its own proper Diurnal Motion, he exceeds, or moves further than his mean Diurnal Motion: *Slow in Motion*, is when his Motion happens to be less than his mean Motion.

SWIFTERS, in a Ship, are Ropes belonging to the Main-masts, and Fore-masts, and help to succour or strengthen the Shrouds, and to keep the Masts stiff: They have Pendants fastened under the Shrouds at the Head of the Masts, with a double Block, thro' which the Swifter is reeved; which at the *standing Part* hath a single Block with a Hook, hitched into a Ring at the *Chain-Wale*, and so the Fall being haled up, helps to strengthen the Mast, and it is belayed about the Timber-heads of the lower Rails aloft.

SWIFTING of a Boat, is compassing her Gunwale round with a good Rope, to strengthen her in a Srels of Weather, that she be not shattered by the Violence of the Sea.

SWIFTING of a Ship, is either bringing her aground, or upon a Careen; for then they use to *Swift the Masts*, to ease and strengthen them, that all the Weight may not hang by the Head; which is done by laying fast all the *Pendants* of the *Swifters* and *Tackles* (with a Rope) close to the Mast, and as near to the Blocks as can be; and then to carry forward the Tackles, and there to *Bowse*, or hale them down as hard and taught as is possible. (So that the Sea Word of Command here is, *Ho! Bowse Men!* All this is done also to keep the Mast from rising out of the *Step*).

SWIFTING the *Capstan-Bars*, is straining a Rope all round the outer Ends of the *Capstan-Bars*, in order to strengthen them, and make them bear all alike, and together, when the Men heave or work there.

SWING-WHEEL, in a Royal Pendulum-Clock, is that Wheel which drives the Pendulum: This Wheel in a Watch is called the *Crown-Wheel*, as also in a Balance-Clock.

SUPERFICIAL Fourneau, a Term in Fortification, the same with *Caisson*, which is a wooden Chest, or Box with 3, 4, 5, or 6 Bombs in it, and sometimes 'tis filled only with Powder; and is used in a close Siege, by being buried under Ground with a Train to it, to blow up any Lodgment that the Enemy shall advance to. Therefore they usually express it thus: "After the Mine, "or Fourneau, had destroyed the *Bonette*, a *Caisson* "was buried under the Ground, thrown up, and "the Enemy advancing to make a Lodgment "on the Ruins of the *Bonette*, the *Caisson* was "fired, and blew up the Post a second time.

SYCOSIS, is an Excrecence of the Flesh about the Fundament; 'tis also an Ulcer, so called from the Resemblance of a Fig; this is of two kinds, one hard and round, the other soft and flat; out of the hard issues a very small Quantity of glutinous Matter; out of the moist proceeds a greater Quantity, and of an ill smell: These Ulcers grow in those Parts only which are covered with Hair; the hard and round chiefly in the Beard; the moist for the most part in the Scalp. *Blanchard*.

SYDERATION. See *Apoplexy*.

SYDERIAL Year. See *Year*.

SYLLEPSIS, or *Conceptio*, (in Grammar) is when the Sense of an Expression is to be conceived otherwise than is imported by the Words; and so the Construction is made accordingly as some define it. But *Vossius* saith, 'tis an Agreement of a Verb or an Adjective, not with that word which is most near, but with that which is most worthy, honourable, &c. in any Sentence, as *Rex & Regina beati*.

SYMBOLS. See *Characters*.

SYMMETRICAL, the same with *Commensurable*.

SYMMETRY, is usually taken in *Architecture* for the Proportion required, according to the Rules of *Geometry*, to make all the Parts of any Structure completely agree to, and with the Whole.

SYMPATHETICAL Inks, are such as can be made to appear or disappear very suddenly by the Application of something that seems to work by Sympathy.

There

There are some ways of preparing Inks of this Kind, which are really wonderful and surprizing, as well as curious and diverting.

The Experiments are these.

Take of good unslacked Lime, two or three Parts, according to the Strength and Goodness of the same, and one Part of *Yellow Orpiment*, (which to powder, had best be wrapt up in a thick Paper, and so beaten, to prevent the dangerous Steams that may affect the Head) both these being powdered and mix'd, put to them 15 or 16 times as much Water in weight, as there was of *Orpin*: Stop the Viol well with Cork and a Bladder, and set it in warm Embers, or some such Place; shaking the Viol now and then for 4 or 5 Hours; then warily decant the clear Part, or which is better, *filtrate* it.

In the mean time burn a piece of Cork thoroughly; and when it is well inflamed, quench it in common Water (or which is better, *Aqua Vita*, or *Brandy*) and by this means reducing of it to a friable Coal, grind it with a sufficient quantity of fair Water, in which you have dissolved a little *Gum-Arabick*, and so it will make a Liquor as black as common Ink, which will serve very well to write any thing with.

While these are doing, dissolve in three times as much distilled, or strong Vinegar, over warm Embers, a Quantity of *Red-Lead*, (or *Minium*) or of *Saccharum Saturni*, in three times as much Water, for 3 or 4 Hours, or till you find the Liquor have a very sweet Taste. This will likewise, as the first Liquor, be clear as common Water.

All things being thus ready (for you must be pretty quick at it) write on a piece of Paper what you will, with this last Liquor, with a clean, or new Pen, and when it is dry, nothing will appear.

Then over that place write with the Ink you made of the Cork, what you please; it will look just as if it had been written with common Ink, which let dry; then dipping a small piece of Rag, or Sponge, in the first Liquor, rub it on the Place written, and you will immediately see the Black writing vanish, and that written with the Invisible Ink, appear Black and Legible.

Take also a Book 4 or 5 Inches thick, and writing on the first Blank Leaf with the last Liquor, or the Invisible Ink; or putting in there a Paper so written, turn to the other end of the Book, and rub there with a Rag dipt in the first Liquor, on that part that is as nearly as you can guess, opposite to the Writing, and leave also the Rag there: And over it clap a folded Paper, and nimbly shutting the Book, strike 4 or 5 good Stroaks on it with your Hand, and then turning it t'other side uppermost, clap it into a Press, or lay it between two Boards with a good Weight on it for a Quarter of an Hour (or half that time will do) then taking it out, you'll find the Writing black and legible, which was written with the Invisible Ink.

This Process, Mr. Boyle communicated in his History of Gold, p. 322. and afterwards Lémery published it in his *Course of Chymistry*, with the Addition of the latter Experiment.

By whose help we may endeavour at a Solution of these strange Experiments, if we consider,

1. That the first of these Liquors is a Mixture of the Alkalizate, and fiery Salt of Quick-lime, with the Sulphureous Substance of the *Orpin*, which is a kind of *Arsenick*.

2. That the Blackness of the Ink, which is the second Liquor, proceeds only from the porous, light, and sooty Parts of the Cork; which are its Oily Parts very much rarified.

3. That the last Liquor (or the Invisible Ink) only the Parts of the Lead held up imperceptibly in the acid Liquor of Vinegar.

Hence then, the Reason of the disappearing of the Ink in the first Experiment, is from the penetrating Parts of the first Liquor, which consisting of an Alkalizate Salt, and a penetrating Oil, or Sulphur, doth make a kind of Soap, which soon dissolves the rarify'd Fuliginosity of the Ink, as common Soap takes away greasie Spots out of Cloaths, &c.

And the invisible Ink then appears black, because the Edges of the acid Liquor that hold the Parts of the Lead dissolved, being now broken by its Conflict with the Alkali of the first Liquor; the Parts of the Lead are, as it were, precipitated on the Paper, and so appear in their proper Colour, which is Black.

So that the Visible Ink disappears, because its black Parts are dissolved; and the Invisible doth appear, because its dissolved Parts are revived, or restored.

The second Experiment shews the strange piercing Subtility of the first Liquor.

You had best make all the Liquors in different Places, lest they should mingle, and so spoil the Experiment, as I have known them sometimes do.

Experiment the Third.

Dissolve a little white, or green Vitriol in Water; and then write with a clean Pen with the Solution, nothing will appear.

Boil Galls in Water, and dip a Rag of Linen in the Decoction, and with it rub the Place before written, and it will appear Black and Legible.

But if you rub over it with a Feather, or a Rag dipt in Spirit of Vitriol, (or its Oil) the Letters will disappear again.

Dip another Rag in Oil of Tartar per Deliquium, and rub on the Place, the Letters will appear again, but of a Yellowish Colour. *Lémery's Chymistry, last Edit. pag. 330.*

R E A S O N S.

The Coagulum of the Vitriol and Galls, is the Cause of the first Blackness, (as is seen in making common Ink) which the acid Spirit of Vitriol dissolves, and so the Letters disappear: But the Oil of Tartar breaking (as it uses to do in all Precipitations) the Force of this acid Spirit, restores the Coagulum, but spoils its Colour a little, by mingling it self with it.

SYMPATHETICK Powder, is only (said Lémery) Green, or Roman Vitriol, opened by the Sun-Beams

Beams penetrating into it, and imperfectly calcining it: The Vitriol is usually exposed to the Sun's Heat in the Month of *July*, but some use only Powder of Vitriol. When they use it, they spread some of the Powder upon a Linen-cloth dip't in the Blood of any Wound, and then pretend, that if the Cloth be many Miles off the wounded Person; yet he shall be healed: But this is so far from being true, notwithstanding the vaunting Stories of Sir *Ken. Digby* and others, that 'twill hardly have its Effect, if done in the same Room where the Patient lies; and he is certainly very much wanting to himself, who will use no other Help.

Vitriol hath its Parts in continual Motion; and 'tis probable, many *Effluvia* may go out from it; and some few of those, if Application be made to the Cloth, just by the Patient, may perhaps enter into the Wound, and help to stop the Bleeding, for Vitriol is a known *Stryck*; but he that will neglect all other Means, and depend only on this, may probably pay dear for his Credulity.

SYMPEPSIS, is a Coction of those Humours, which are growing into an Impostume.

SYMPHYSIS, is the joining of two Bones of which neither has a proper distinct Motion: This is either without any Medium, or else with it, as with a Cartilage, or Gristle, a Ligament, or Flesh, &c.

SYMPTOM, is a preternatural Disposition of the Body, occasioned by some Disease; this is either a Disease caused by another Disease; or else the Cause of a Disease proceeding from another Disease; or else simply a Symptom: This last is either some Action of the Body hindered, or disturbed, some Fault of the Excrement, or change of the Natural Temper. *Blanchard*.

SYMPTOMATICAL Fevers, according to some, are those which arise from the Inflammation and Putrefaction of Humours contained in some of the Bowels, of which kind are those *Fevers* that accompany the *Pleurisie*, *Inflammation of the Lungs*, and *Liver*, *Frenzy*, *Quinsie*, and other Inflammations, as Ulcers of the Internal or External Parts.

SYMPTOTES. See *Asymptotes*.

SYNACTICA, are Medicines that contract any Part.

SYNALÆPHA, is a Figure in the Dimension, or Scanning of a *Latin* Verse; whereby there is a Coalition of the two Vowels or Diphthongs, one of which ends, and the other begins two contiguous Words in a Verse, so that they make but one.

SYNARTHROSIS, is a joining of Bones by a Gristle, and is of two sorts, *viz. Sutura*, and *Gomphosis*, which see.

SYNCHONDROSIS, the same with *Synarthrosis*.

SYNCHYSIS, in *Grammar*, is a confused and disorderly placing of Words in a Sentence.

SYNCHYSIS, a Disease, is a preternatural Confusion of the Blood, or Humours of the Eyes. *Blanchard*.

SYNCOPALIS Febris, or the *Swooning Fever*; is that in which the Patient often swoons and Faints away. *Blanchard*.

SYNCOPATION, a Term in Musick, which is when a Note of one Part ends and breaks off upon the middle of a Note of another Part.

SYNCOPE, in Musick, is the driving a Note, when some shorter Note prefix'd at the beginning of the Measure, or Half-measure, is immediately

follow'd by two, three, or more Notes of a greater Quantity, before you meet with another short Note equivalent to that which began the driving, to make the Number even. As when an odd *Crotchet* comes before two, three, or more *Minims*, or an odd *Quaver* before two, three, or more *Crotchets*.

SYNCOPE, in *Physick*, is a sudden Prostration or Swooning, with a very weak, or no Pulse, and a Depravation of Sense and Motion.

SYNCOPE, in *Grammar*, is the taking away a Letter or Letters, out of the middle of a Word: As *Dixti* for *Dixisti*, *Repositum* for *Repositum*.

SYNCRITICA, are relaxing Medicines.

SYNDESMUS, or *Syndesmosus*, the same with a *Ligament*.

SYNDROME, is a Concurrence of several Symptoms in the same Disease.

SYNECDOCHE, a Trope in *Rhetorick*, where the Name of the the Whole is put for Part; or the Name of the Part for the Whole: As if we should say, *Europe for England*, or *England for Europe*.

SYNECDOCHE, in *Grammar*, is when the Ablative Case of the Part, or the Adjunct, is changed into the Accusative: As in that of *Virgil*:

Deiphobum vidi lacerum crudeliter Ora.

And in this:

Flores inscripti nomine Regum.

SYNECOPHONESIS, or *Synizesis*, is a Figure in *Grammar*, whereby two Vowels are contracted into one, as in this Verse of *Virgil*.

Seu lento fuerint Alvearia vimina texta.

Where the *ea* in *Alvearea*, are contracted into one Vowel.

SYNEDRENONTA, are common Symptoms which accompany Diseases; and yet neither flow from the Nature of the Disease, nor are necessary Concomitants of it; but do, notwithstanding, signify the Greatness, Continuance, &c. of the Disease.

SYNANCHE, is a sort of *Squinnacy*, which quite stops the Breath, or a preternatural Inflammation of the Muscles of the Jaws.

SYNEUROSIS, is an Articulation of Bones by a Ligament; as the Extremity of the *Ulna*, is joined to the Bones of the *Carpus*.

SYNGULTUS, the *Hiccough*, is a depraved Convulsive Motion of the Stomach, by which it endeavours to expel something that is hurtful, or offensive.

SYNIZESIS. See *Synecphonesis*.

SYNOCHA, is a continued intermitting Fever, this lasts for many Days with a great Heat, sometimes Putrefactions of the Blood; it is either *Quotidian*, *Tertian*, or *Quartan*. *Blanchard*.

SYNOCHUS, is a continued Fever without any Intermission, or Abatement of the Heat, which continues for many Days: This is either simple, or accompanied with Putrefaction. *Blanchard*.

SYNOD, a Meeting or Assembly of Ecclesiastical Persons concerning Religion: Of which there are four Kinds.

1. *General*, where Bishops, &c. meet of all Nations.

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2. *National*,

2. *National*, where those of one Nation only come together.

3. *Provincial*, where they of one only Province meet.

4. *Diocesan*, where those of but one Diocess meet : See *Convocation*, which is the same with *Synod*, only the one is a Greek, and the other a *Latine Word*. *Cowel's Interpreter*.

SYNODICAL Month, is the Space of Time, (*viz*, 29 Days, 12 Hours, 45 Minutes) contained between the Moon's parting from the Sun at a Conjunction, and returning to him again ; during which Time she puts on all her Phases. And her

SYNODICAL Revolution, is that Motion whereby her whole System is carried along with the Earth round the Sun.

SYNONOMY, is when the same thing is expressed by several Words that have but one and the same Signification : As if one should say, *He went away, he escaped, he fled*.

SYNTASIS, is a preternatural Distention of the Parts.

SYNTECTOE, is a kind of Looseness that proceeds from the melting away of the Substance of the Body by a violent hot Distemper of the solid Parts such as sometimes happen in the Inflammation of the Bowels, and in a vehement burning Fever, Hectick, or Pestilential ; in which a fat Matter, as it were mixt with Oil or Grease, is voided by Stool.

SYNTENOSIS, is reckon'd by some to be the Union of one Bone to another, by a *Tendon* ; as the Knee-pan to the Thigh-bone and *Tibia*.

SYNTERETICK Medicines, are that Part of Physick, which give Rules for the Preservation of Health.

SYNTEXIS, is a Consumption and Colliquation of the Body, in which first the Flesh is wasted, and afterwards the Substance of the more solid Parts. *Blanchard*.

SYNTHESIS, is either the Frame and Structure of the whole Body ; or more strictly, the Composition of the Bones. 'Tis also used in *Mathematicks*, in Opposition to the Word *Analysis* ; in which Sense it signifies *Composition*, or the

SYNTHETICAL Method of Enquiry, or *Demonstration* in *Mathematicks*, is when we pursue the Truth chiefly by Reasons drawn from Principles before established, and *Propositions* formerly proved, and proceed by a long regular Chain, till we come to the Conclusion : As is done in the Elements of *Euclid*, and in almost all the *Demonstrations* of the Ancients. This is called *Composition*, and is opposed to the Analytical Method, which is called *Resolution* ; which see.

SYNTHESIS is also used by the *Grammarians*, to signify an Agreement of the Parts of a Sentence as to Sense, but not as to the Words.

SYNULOTICKS. See *Cicatrifantia*.

SYNYMENSIS, is taken to be the uniting of Bones together by a *Membrane*, as in Infants, the Bones of the *Syniput*, with the *Os Frontis*.

SYPHON, is a Tube, or Pipe of Glats, or Metal, which is usually bent to an Acute Angle, and having one Leg shorter than the other ; they are frequently to draw off Liquors out of one Barrel or Vessel into another, without raising the Lees,

or Dregs, and are called *Cranes*. Sometimes Glats Tubes or Pipes, tho' strait, are called *Syphons*.

For the Cause of the running of Water, or other Liquors, through the *Syphons* or *Cranes* : See *Hydrostaticks*, *Paradox* 10.

SYRINGE, is an Instrument which is used in injecting Liquors into Wounds, Ulcers or any diseased Parts of the Body.

SYRINGOMATA, are Chirurgeons Knives, which they open *Fistula's* with.

SYRINGOTOMIA, is the Incision of the *Fistu'a*.

SYSSARCOSIS, is the Connexion of Bones by Flesh. *Blanchard*.

SYSTEM, in Musick, is the Extent of a certain Number of *Chords*, having its Bounds toward the *Grave* and *Acute*, which hath been differently determined by the different Progress made in Musick, and according to the different Divisions of the *Monochord*.

The System of the Ancients was composed of four *Tetrachords*, and one *Supernumerary Chord*, the whole making Fifteen Chords.

SYSTEM properly is a regular orderly Collection, or Composition of many things together.

Thus the *Solar System*, is the Aggregate Union, or orderly Disposition of all those Planets which move round the *Stn* as their Centre, in determin'd Orbits, and never deviate farther from him than their proper and usual Bounds. And a

System of Philosophy, is a regular Collection of the Principles and Parts of that Science into one Body, and a treating of them Dogmatically, or in a Scholastical Method ; which is called the *Systematical Way*, in Contra-distinction of the *Way of Essay*, wherein the Writer delivers himself more loosely, easily and modestly.

The Learned Dr. *Hook*, did in the Year 1674, at the End of his Attempt to prove the Motion of the Earth by Observation, promise that he would explain a System of the World, differing in many things from any then known, and yet exactly agreeable to Mechanical Principles. Which System he there says, depends on these three Suppositions, *viz*.

First, That all the Heavenly Bodies have a gravitating or attracting Power towards their own Centers, whereby they attract not only their own Parts, and keep them from flying off from them, but also all other Celestial Bodies within the Sphere of their Activity.

Secondly, That all Bodies put into a direct and simple Motion, will so continue to move forwards in a strait Line, till they are by some or other more effectual Power bent or deflected into a Motion, which describes some Curve Line.

Thirdly, That these attractive Powers are so much the more powerful in operating by how much the nearer the Body wrought upon, is to their own Centers.

All which is abundantly confirmed in Sir *Isaac Newton's Admirable Principia Philosophiæ Mathematicæ*.

SYSTOLE, in *Anatomy*, is the Contraction of the Ventricles of the Heart, whereby the Blood is forcibly driven into the great Artery.

SYSTOLE

SYSTOLE, in *Grammar*, is part of the Poetical License, whereby a long Syllable is made short: As in that of *Virgil*:

— *Tulerunt fastidia Menses.*

SYSTYLE, in *Architecture*, is a Building where the Pillars stand thick, but not altogether so close as in the *Pychnostyle*; the Inter-columniation; or

Distance between them, being only two Diameters of the Column.

SYZYGIE, in *Astronomy*, is the same with the Conjunction of any two Planets, or Stars, or when they are both referred to the same Point in the Heavens; or when they are referred to the same Degree of the Ecliptick, by a Circle of Longitude passing through them both.

T A C

TABES. See *Atrophia*.

TABES dorsalis, a Consumption in the spinal Marrow, incident to those who are too much addicted to Venery, they are without a Fever, eat well, and yet waste, or consume away: If you ask one in this Disease an account of himself, he will tell you, that there seems as if so many Pisnires did crawl from his Head down upon his spinal Marrow; when he eases Nature, either by Urine or Stool, there flows thin liquid Matter like a Semen plentifully; when he goes or runs any way, but especially by a steep Place, he grows weak and short-breathed, his Head is Heavy, and his Ears tingle; so in process of Time he dies of a Fever called *Lipiria*, where the External Parts are cold, and the Internal burn at the same time. *Blanchard*.

TABLE, in *Architecture*, is a smooth and simple Part of a different Figure; but most commonly in Form of a long Square, or of a Triangle.

Projecting Table, is that which jets out beyond the naked Face of a Wall, Pedestal, or any Part whereof it makes the Ornament: And a

Raked Table, is that which is hollow'd in the Square of a Pedestal, or elsewhere.

TABLETS, or solid Electuaries, are much the same with *Lozenges*, being made usually of Sugar and Powder, &c. incorporated well together, and given in many Diseases, especially those of the Lungs and Breast.

TABLING of Fines, is the making a Table for every County where his Majesty's Writ runs, containing the Contents of every *Fine* passed in any one Term, as the Name of the County, Towns, and Places, wherein the Lands or Tenements lie; the Name of the Demandant and Deforçant, and of every Manor named in the *Fine*.

TABUM, is a thin sort of Matter that comes from an ill Ulcer. *Blanchard*.

TACK, in a Ship, is a great Rope having a *Wale-knot* at one End, which seized or fastened into the Clew of the Sail; so is reeved first thro' the *Cheefe Trees*, and then is brought thro' a Hole in the Ship's Side. Its Use is to carry forwards the Clew of the Sail, and to make it stand close by a Wind: And whenever the Sails are thus trimmed, the Main-tack, the Fore-tack, and Mizen-tack are brought close by the Board, and haled as forward on as they can be. The Bowlings also are so on the Weather side; the Lee-sheets are haled close aft, and the Lee-braces of all the Sails, are likewise braced aft. Hence they say, a Ship *Sails*, or *stands close upon a Tack*, i. e. close by the Wind. *Hale aboard the Tacks*; that is, Bring the Tack

T A I

down close to the Chefs-trees. *Ease the Tack*, i. e. Slacken it, or let it go, or run out. *Let rise the Tack*, i. e. Let it all go out. The Tacks of a Ship are usually belayed to the *Bitts*, or else there is a *Chevil* on purpose to fasten them.

TACK about: The Word, when a Ship's Head is to be brought about so as to lie a contrary Way; to do which, First they make her stay, (See *Stay*) and when she is stay'd, they say, She is *Pay'd*. The next Word is, *Let rise and Hale*, that is, Let the *Lee-tack rise*, and *Hale aft the Sheets*, and so trim all the Sails, by a Wind as they were before; for they cast off that which was before the *Weather-Bowling*, and set up the other taught; and so they do also by all *Sheets*, *Braces* and *Tacks*, which a Ship that is trimmed by a Wind must have.

TACKLES, in a Ship, are small Ropes running in three Parts, having at one End a *Pendant* with a Block fastened to them, or else a *Lannier*; and at the other End, is a Block and an Hook to hang any Goods upon, which is to be heaved into the Ship, or out of it.

There are several sorts of these *Tackles*.

1. The *Boat Tackles*, which serve to hoist the Boat in and out, as also for many other Uses: These stand on the Main-mast Shrouds, the other on those of the Fore-mast.

2. The *Tackles* belonging to the Masts, these serve as a kind of Shrouds, to keep the Masts from straining.

3. The *Gunnery-Tackles*, with which the Ordnance are hoisted in and out.

4. There is also another called *Winding-Tackle*; which see under that Word.

There is also another kind of *Tackle* which is called a *Burnett*. See *Burnett*.

TACTILE Quantities, are such as have a primary Relation to the Sense of Feeling, or to our Touch: As Heat and Cold, &c.

TÆNIA, in *Architecture*, is a Member of the *Doric* Capital, which resembles the Shape of a square Fillet, and serves instead of a *Cymetium*, being fastened, as it were, to a Capital below the *Triglyphs*, whereof it seems to be the Base.

TAFFEREL, is the uppermost Part, Frame, or Rail of a Ship abaft over the Poop.

TAILE, in common Law, signifies two several Things both grounded upon one Reason. First, it

is to be used for the *Fee*, which is opposite to *Fee-Simple*, by reason it is so minced or parted, as it were, that it is not in the Owner's free Power to dispose, but is by the first Giver cut or divided from all others, and tied to the Issue of the Donee: And this Limitation of *Tail*, is either *General*, or *Special*.

Tail General, is that whereby Lands or Tenements are limited to a Man, and to the Heirs of his Body begotten; and it is so called, how many Wives soever the Tenant holding by this Title, shall have one after another in Lawful Marriage; his Issue by them all, have a Possibility to inherit one after another.

Tail Special, is when Lands or Tenements limited to a Man and his Wife, and the Heirs of their two Bodies begotten; and hath this Term of *Special*, because if the Man bury his Wife before Issue, and take another, the Issue by his second Wife cannot inherit the Land, &c. Also, if the Land be given to a Man and his Wife, and their Son R. for ever; this is *Tail Special*.

TAIL after Possibility of Issue Extinct, is where Land is given to a Man and his Wife, and to the Heirs of their two Bodies, the one over-lives the other without Issue between them begotten; he shall hold the Land for Term of his own Life, as Tenants in *Tail after Possibility of the Issue Extinct*; and notwithstanding that he do waste, he shall never be impeached of it: And if he Alien, he in the Reversion shall not have a Writ of Entry *in consimili Casu*, but he may enter, and his Entry is Lawful.

TAILLOIR. See *Abacus*.

TAINT, in Law, signifies Substantively, either a Conviction; or Adjectively, a Person Convicted of Felony or Treason, &c. See *Attaint*.

TAKE and *leave*, they say at Sea, that when a Ship fails so well that she can come up with another, or out-fail her when she pleases; that she can *Take and Leave upon her*, whenever she will.

TALES, in Law, is taken for a supply of Men, impannelled upon a Jury or Inquest, and not appearing, or at their Appearance challeng'd by either Party as not indifferent; in which Case the Judge upon Motion, grants a Supply to be made by the Sheriff of one or more such there present; and hereupon the very Act of supplying is called a *Tales de Circumstantibus*: But he that hath had one *Tales* either upon Default or Challenge, may not have another to contain so many as the former: For the first *Tales* must be under the principal Panel, except in a Cause of Appeal, and so every *Tales* less than other, until the Number be made up of Men present in Court, and such as are without Exception; yet this general Rule is not without some Exceptions, as appears by *Stamford Pl. Cor. Lib. 3. Cap. 5*. These commonly called *Tales*, may in some sort, and indeed are called *Meliores*, viz. when the whole Jury is challenged.

TALLY the Sheats, is a Word of Command at Sea, when the Sheats of the Main-sail or Fore-sail are to be halled aft. See *Sheets*.

TALON, a small Member in Architecture composed of a square Fillet, and a straight *Cymesium*. It differs from the *Astragal*, which is a round Member, whereas the *Talon* consists of two Portions of a Circle, one without, and the other within; and when the Concave Part is uppermost, it is called *Reversed Talon*.

TALPA, is a Tumor so called, because that as a Mole (in Latin *Talpa*) creeps under Ground; so this feeds upon the Skull under the Skin: It may be referred to the Species of *Athermas*; which see. *Blanchard*.

TALUS, the same with *Astragalus*. See it described under the word *Torsus*.

TALUS, or *Talus*, properly signifies any Thing that goes sloping, as the *Talus* of a Wall in Masonry, when its thickness is diminished by Degrees as it rises in height. But in *Fortification*, the *Talus* of a *Bastion* or *Rampart*, is the Slope allowed to such a Work whether it be of Earth or Stone, the better to support its Weight.

TALUS Exterior, of a Work, is its Steepness on the Sides of the Field; and is always made as little as possible, to prevent the Enemies *Scalado*, unless the Earth be bad, then it is absolutely necessary to allow a considerable *Talus* for its *Parapet*.

TALUS Interior, of a Work, is its Steepness on the inside towards the Place.

TAMPKIN, *Tampion*, or *Tampin*, at Sea, is a round piece of Wood filled with the Muzzle of a great Gun, which serves to stop it so, that no Water or Rain may get in to wet the Powder.

TANGENT, of a Parabola, (or other Conick Section, or Geometrical Curve) is a Right Line drawn, cutting the Ax produced, and touching the Section in one Point without cutting it.

In *Philos. Transact. N. 90*. there is an easie Method of *Slusius*, to draw Tangents to all Geometrical Curves without any Labour of Calculation: The Demonstration of which you have afterwards, *Hunts 95* communicated by the same Author, and is contained in these three *Lemmata*.

1. The Difference between any two Dignities, or Powers of the same Dimensions or Degrees divided by the Difference between the Roots of those Powers, gives several Parts or Members of the next inferior Powers, which may be formed from those two Roots, as from a Binomial, thus.

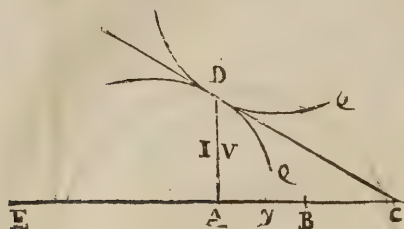
$$\frac{x \ x x - y \ y y}{x - y} = x \ x + x \ y + y \ y.$$

2. There are always so many several Members in any Degree or Power raised from a Binomial, as are the Unites in the Exponent of the Power next above it. Thus in the Square of a Binomial there are three Members, in the Cube, there are four, &c.

3. If any Quantity divide 2 others whose Ratio is given, the Quotients will be also reciprocally in the same given Ratio; or that the Quotients of any two Numbers, or Quantity, divided by one and the same Quantity, are as the Dividends.

This premised, Let there be any *Curve*, as D Q, whose Points are all referable to any Right Line given, as E A B, whether that Right Line be the Diameter, or not; or whether there be more given Right Lines than one, if their Powers do but come into the Equation, 'tis enough.

And in all his Equations he puts V always for the Line D A, y for B A; and for E B, and the other given Lines, he puts b, d, &c. i. e. always, Consonants.



Then supposing DC to be drawn touching the Curve in D, and meeting with EB, produced in C, he always calls the sought Line CA, by the Name of a .

To find which he gives this general Method.

RULE I.

He rejects out of the Equation all Members which have not either V or y with them; then he puts all those that have y on one side, and all those which have V on the other, with their Signs $+$ or $-$. And the latter for Distinction and ease-sake, he calls the *Right*, the former the *Left Side*.

RULE II.

On the Right Side, let there be prefix'd to each Member, the Exponent of the Power which u hath there: Or which is all one, Let that *Exponent* be multiplied into all the Members.

RULE III.

Let the same be done also on the Left Side, multiplying each Member there by the *Exponent* of the Power of y .

Adding this moreover, That one y must (in each Member) be always changed into a .

This done, I say, that the Equation thus reformed, will shew the Method of drawing the required Tangent to the Point D; and when that is given, as also y , u , and the other Quantities expressed by Consonants, a cannot be unknown.

Let there be this Equation $b y - y y = V V$, in which EB is b , BA is y , DA is V , and let a , or AC be required to find the Point C, from whence CD being drawn, shall be a true Tangent to that Curve QD, in D.

In this Example nothing is to be ejected out of the Equation, because y or V , are in each Member: 'Tis also so dispos'd as required by Rule 1. To each part therefore there must be prefix'd the Exponent of the Powers of y and V , as in Rule 2; and on the Left Side let one y be changed into a : And then the Equation will be in this Form, $b a - 2 y a = 2 V V$, which Equation reduced, gives easily the Value of $a = \frac{2 V V}{b - 2 y} = A C$. And so the Point C is found, from whence the Tangent DC may be drawn.

To determine which way the Tangent is to be drawn, whethertowards B or E, he directs to consider the Numerator and Denominator of the Fraction, which at last is found equal to a . For,

1. If in both Parts of the Fraction, either all the Signs are Affirmative, or if the Affirmative ones are more in Number, then the Tangent is to run towards B.

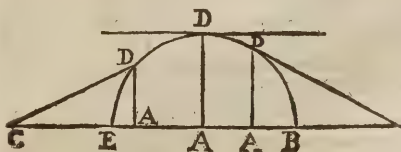
2. If the Affirmative Quantities are greater than the Negative in the Numerator, but equal to them in the Denominator, the Right Line drawn thro' D, and touching the Curve in that Point, will be parallel to AB: For in this Case, a is of an infinite Length.

3. If in both Parts of the Fraction, the Affirmative Quantities are less than the Negative, changing all the Signs, the Tangent must be drawn now also towards B: For this Case, after the Change, comes to be the same with the first.

4. If the Affirmative Quantities are greater than the Negative in the Denominator, but in the Numerator are less, or *vice versa*; then changing the Signs in that Part of the Fraction where they are less, the Tangent must be drawn a contrary way; i. e. AC must be taken towards E.

5. But whenever the Affirmative and Negative Quantities are equal in the Numerator, let them be how they will in the Denominator, a will vanish into nothing: And consequently either AD it self is the Tangent, or else EA; or at least, a Line Parallel to EA, as will easily be found by the Data.

This he gives plain Examples of, in Reference to the Circle, thus.

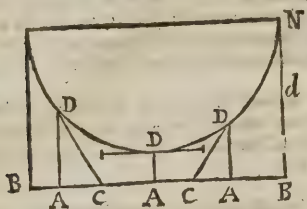


Let there be a Semi-circle, whose Diameter is EB, in which there is given any Point; as D, D, D, &c. from which the Perpendicular DA, is let fall to the Diameter.

Let DA = V , BA = y , BE = b : Then the Equation will be $b y - y y = V V$, and drawing the Tangent DC, AC or $a = \frac{2 V V}{b - 2 y}$

Now if b be greater than $2 y$, the Tangent must be drawn towards B, if less, towards E, if it be equal to it, it will be Parallel to EB, as was said in the 1st, 2d, and 4th Rules.

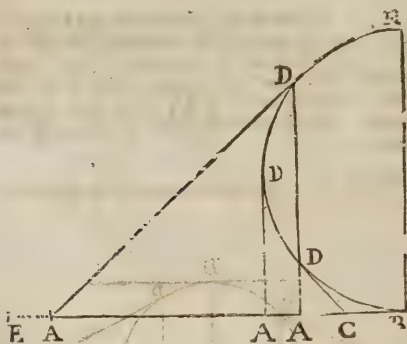
Let



Let there be another Semi-circle inverted; as, NDD; the Points of whose Periphery are referred to the Right Line BB, parallel and = to the Diameter.

Let NB be called d ; and all things else, as before; then the Equation will be $by - yy = dd + VV - 2dV$; which being managed according to his Rules, you have $a = \frac{2VV - 2dV}{b - 2y}$

Now since V here is supposed to be always less than d ; if b be greater than $2y$, then the Tangent must be drawn towards E; if equal, it will be parallel to BB; if less, changing all the Signs, the Tangent must be drawn towards B, as by Rule 4, 5, and 3. But there could be no Tangent drawn, or at least, EB would be it, if NB had been taken equal to the Diameter.



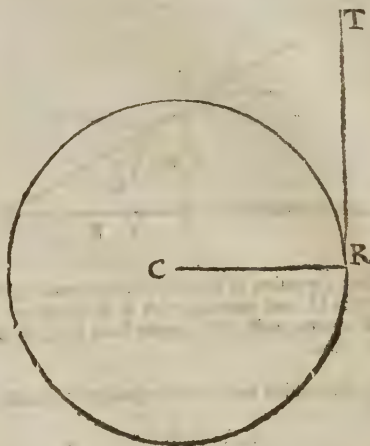
Let there be another Semi-circle, whose Diameter NB, is perpendicular to EB, and to which its Points are supposed to be referred.

Let NB be called b , and all things else as above; the Equation will be $yy = bV - VV$, and $a = \frac{bV - 2VV}{2y}$

If now b be greater than $2V$, the Tangent must be drawn towards B, if lesser, towards E, if equal, DA will be the Tangent; as by Rule 1, 4, and 5, appears.

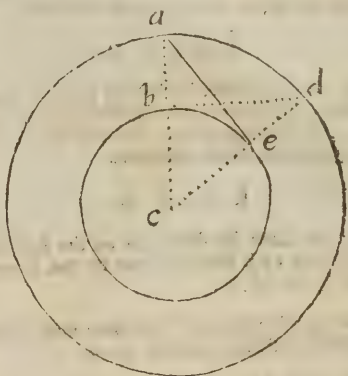
N.B. In the *Alta Eruditorum* for December, 1682, there is an universal Method for drawing Tangents to all Curves, which is an Improvement of this.

TANGENT of a Circle in Geometry, is a Right Line, as TR drawn without the Circle, perpendicular to some Radius, as CR, and which touches the Circle but in one Point.



PROBLEM.

To draw from a Point given, as a , the true Tangent ae , to any given Circle, as cbe .



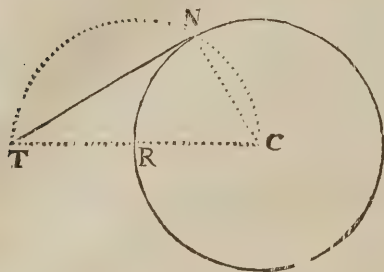
Join the Point a and the Center of the Circle, by drawing the Line ac . Then with the Radius ac on c , describe another Circle; erect a Perpendicular on b , which shall cut the latter Circle in d ; draw de , cutting the former Circle in e ; then ae being drawn, is the Tangent required.

Demonstration.

The Line ae is a true Tangent, because perpendicular to the Radius ce , and 'tis perpendicular to ce , because cea is a Right Angle; and cea is a Right Angle, because 'tis equal to cbd , (which was made so by Construction) and 'tis equal to cbd , because the Triangle cbb , is equal to the Triangle aoc , as having two Sides and one Angle equal: Wherefore the Angle cea , is equal to the Angle cbd , which is a Right Angle. Q. E. D.

Another very expeditious way of drawing a Tangent to a Circle, is this.

Let

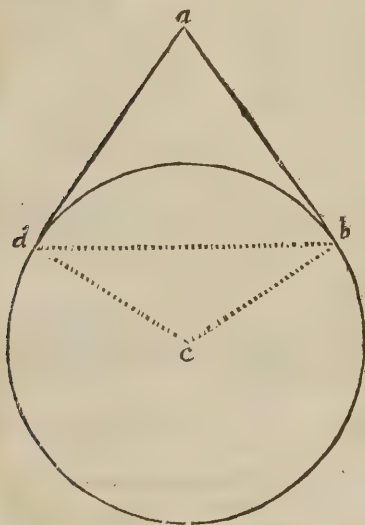


Let the Circle be RNC , the Point of Contact N ; transfer the Radius NC , any where from N , downwards into the Position RC ; so that RN be equal to RC ; then with RC on the Center R , strike a Semicircle, and a Ruler laid from C thro' R , will find the Point T ; from whence TN being drawn, will be a true Tangent, because the Angle TNC being in a Semicircle, is a Right one.

PROPOSITION I.

If two Tangents be drawn to any Circle from a Point (a) without, these Tangents shall always be equal.

I say, $ad = ab$.

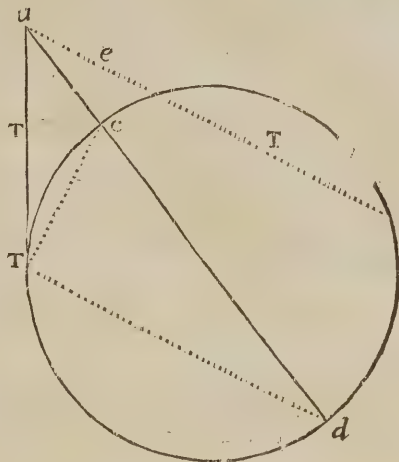


Demonstration.

The Triangle dbc being an Isosceles, the Angle $cbd = \text{Angle } cdb$; the Right Angles adc , and abc are also equal: Wherefore if from these right and equal Angles, you severally take the equal Angles cbd , and cdb , the Remainders abd , and adb , must be equal, and consequently the opposite Sides ad , and ab , to those Angles must be equal. *Q. E. D.*

PROP. II.

If a Tangent (aT) and a Secant (ad) be drawn from the same Point (a) without a Circle; the Tangent will be a mean Proportional between the whole Secant (aT) and the Part (ac) without the Circle.



Or, as Euclid expresses it.

The Square of the Tangent (aT) is equal to the Rectangle made by the whole Secant (ad) and the external Part (ac) That is, $aT^2 = ad \times ac$.

Draw cT , and Td .

Demonstration.

Then will the Triangles Tac , and Tad , be similar; for the Angle a is common to both, and $aTc = d$, because made by a Tangent aT , and a Secant cT . Therefore $ca : aT :: aT : ad$. That is, aT is a mean Proportional between ca , and ad ; and also $\square aT = \square dae$. *Q. E. D.*

COROLLARY I.

Hence may a Line be easily divided, according to extreme and mean Proportion; if from a Secant-wise to the Circle, you draw a Line so as that the Part within be equal in length to the Tangent. Thus, Let the prick'd Line be so drawn from a , that the Part within the Circle be equal to T . Then 'tis plain, if the Part without be called e , by this Proposition,

$$ee + eT = TT.$$

TANGIBLE Bodies, are such as are discoverable and sensible by our Feeling, or Touch.

TAPER-BORED, in Gunmery, a Piece of Ordnance is said to be Taper-bored, when it is wider at the Mouth, than towards the Breech.

TARAXIS, is a Perturbation of the Humours of the Eye, the Stomach, or the Entrails. *Blanchard.*

TARE and *Tret*, *Tare* is the Weight of Box, Straw, Cloths, &c. wherein Goods are packed.

The other, *viz.* *Tret*, is a Consideration allowed in the Weight for Waite, in emptying and reselling the Goods.

TARIF, (in *Arithmetic*) is either a small Table of the Divisor multiplied by the 9 Digits to expedite Multiplication; or else a Proportional Table contrived for the expediting a Question in the Rule of Fellowship, when the Stocks, Losses and Gains are very numerous.

TAR-PAWLING, in a Ship, is a piece of Canvas well Tar'd over, to lay on any Place to keep off Rain.

TARSUS, is a Cartilaginous Extremity of the Eye-lids, whence the Hairs spring, called *Cilium*. *Blanchard*.

TARSUS, is the space between the lower End of the two Focils, and the Beginning of the Five long Bones which sustain, and are articulated with the Toes: Some call this the *Instep*, but that is the *Metatarsus* rather.

The *Tarsus* hath seven Bones, which differ from one another very much in both Shape, and Bigness.

The first, is the *Talus* called also *Astragalus*; the *Ankle* or *Huckle-bone*: This Bone has above a convex Head with a shallow *Sinus* in it, articulating with the *Tibia*: By the Process of which *Tibia*, which makes the Inner Ankle, it is hedg'd in, as it were, on the inside, as it is by that of the *Fibula* on the outer; before, it hath a long Neck, on which grows a round Head, that enters into the *Sinus* of the *Os Naviculare*; on which jointing the Foot is moved side-ways: Its inner side is rough, and above hath a Transverse *Sinus* to receive the Ligament of the *Tibia*, and below there is a descending *Sinus*, by which the Tendons of the Muscles of the Foot pass: At the bottom of all there is a *Sinus* behind, and Protuberance before, by which it is articulated with the *Os Calcis* by a *Ginglymus*.

The second Bone of the *Tarsus*, is the *Os Calcis*, or *Calcaneum*, which see.

The third, is the *Os Scaphoides*, *Naviculare*, or *Cymbiforme*, which see.

The remaining Four stand all in one Rank, being less than the three former; and the first, articulates with the *Os Calcis*; the other three, with the *Os Naviculare*: There is no Cartilage between them, but they are knit together on the outside like a Cartilaginous Ligament. The first of these is called *Cubiforme*, having six almost equal sides, is the greatest of these Four, and is seated on the outside of the Foot. See *Cubiforme*. The other three are called *Ossa Cuneiformia*, from their Wedge-like Shape; for above they are thick, and below they are thin. See that *Word*.

TARTAR Emetick. See *Emetick Tartar*.

TARTAR Soluble. See *Soluble Tartar*.

TARTAR Vitriolate, is made by pouring Spirit of Vitriol on Oil of Tartar, *per Deliquium*, by little and little; and when the Effervescence is over, placing the Glass in the Sand, and evaporating the Moisture with a small Heat, that a very white Salt may remain at the Bottom. This is the Tartar Vitriolate; 'tis a good Apertitive, and a little Purgative Medicine, and works also by Urine: Dose from 10 to 30 Grains.

TAST; is probably caused by the Salts that are in Bodies; which, according to their various Configurations, affect the Tongues as variously; and tickling, or otherwise moving the Extremities of these small Nerves, which terminate in the *Papille* of the Tongue, communicate a pleasant or ungrateful Sensation to the Brain.

The Organ of Taste seems to be neither the Membranes, nor the Nerves of the Tongue, (properly speaking) nor the *Glandule Amygdalinae*; but those little Eminences, or *Papilla*, which are found on the Tongues of all Animals.

For First, those *Papilla* are found plentifully from the Root of the Tongue to the *Tip*; but none from thence to the *String*; or at least but very few.

Secondly, any *Salt*, or strong tasted Object, being placed on the Parts void of those *Papilla*, affects not the Taste at all.

Thirdly, In those *Papilla*, in the Tongues of Live Animals, may (by a Microscope) be discerned many small Holes supply'd at the Bottom by small Nerves, which communicate the Sensation to the Brain.

That various Tastes may be Mechanically produced, and that Sapours do depend on the Shape, Size, Motion, &c. of the small Saporifick Particles of the Saporous Body.

The Honourable Mr. Boyle, hath abundantly made out by Experiments and Observations, about the Mechanical Production of Tastes.

Dr. Grew, in his Lecture about the Diversities of Taste, read before the Royal Society, March 25th 1675. distinguishes Tastes into Simple and Compound.

By the former of which, he understands such as are Simple or Single Modes of Tastes, altho' mingled with others in the same; thus, the Taste of a Pepin, is *Acid-dulcis*; of Rhubarb, *Amara-stringent*, and therefore compounded in both; but yet in the Pepin the Acid is one Simple Taste, and the Sweet another; as distinct as the Bitter, and Astringent are in the Rhubarb.

Two Faults, saith the Doctor, have here been committed: The *Defective Enumeration of Simple Tastes*, and *Reckoning them Indistinctly among such as are compounded*.

Simple Tastes, (of which usually are reckoned not above six or seven Sorts) are, at least, *sixteen*.

1. *Bitter*, as in Wormwood, whose contrary is,
2. *Sweet*, as in Sugar.
3. *Sower*, as in Vinegar; whose contrary is,
4. *Salt*.
5. *Hot*, as in Cloves; to which is opposite,
6. *Cold*, as in *Sal Prunelle*; for we may as properly say, a *Cold Taste*, as an *Hot one*; since there are some Bodies which do manifestly impress the Sense of Cold upon the Tongue, tho' not to the Touch.
7. *Aromatick*; to which is contrary,
8. *Nauseous*, or malignant.
9. He thinks also, that Tastes may be distinguished into such as are *Soft*, which are either *Vapid*, as in Water, Starch, Whites of Eggs, &c. or *Unctuous*, as in Oils, Fat, &c.
10. Or such as are *Hard*.

Of which he reckons four Kinds. As,

1. *Penetrant*, which worketh it self into the Tongue, without any Pungency; as is found in the Root and Leaves of Wild Cucumber.

2. *Stupefacient*, as in the Root of black Hellebore; which being chewed, and for some Time retained upon the Tongue, affects the Tongue with a Numbness, or Paralytick Stupor.

3. *Astringent*, as in Galls. And,

4. *Pungent*, as in Spirit of *Sal Armoniack*, which two Tafts he makes contrary to the *Unctuous*; as *Penetrant*, and *Stupefacient*, are contrary to the *Vapid* one.

The compounded Tafts are very numerous, but we have Words to express but six of them. As,

1. *Austere*, which is *Astringent* and *Bitter*; as in the green and soft Stones of Grapes.

2. *Acerb*, properly so called, is *Astringent* and *Acid*; as in the Juice of unripe Grapes.

3. *Acrid*, which is Pungent and Hot.

4. *Muriatick*, is Salt and Pungent; as in common Salt.

5. *Lixivious*, which is Saltness joined with some Pungency and Heat.

6. *Nitrous*, which is Saltness, joined with Pungency and Cold.

TAUGHT, in the Sea Language is the same as setting a Rope stiff, or fast. They say, *Sett Taught the Shrouds*, to Stays, or any other Ropes which are too slack, and loose.

TAUNT, when the Masts of a Ship are too tall for her, they say she is *Taunt-masted*, or that her Masts are very *Taunt*.

TAURUS, is the second Sign of the *Zodiack*.

TAUTOLOGY, is a vain Repetition of Words, which serves only to lengthen out Discourse, and tire the Reader.

Tautological Echo's, are such as repeat the same Sound of Syllable many times; whereas those which repeat many Syllables or Words distinctly, are called *Poly syllabical Echo's*.



TAW: The Heralds have an Ordinary which they reckon among the Crosses, called by this Name, and of this Figure.

TECHNICAL, is sometimes the same with *Artificial*, and expresses whatever relates to the Arts and Sciences, as the *Term*, *Rules*, &c. So that the Terms of Art are commonly called *Technical Words*.

TEETH. The Teeth are called in *Latine*, *Dentes*, quasi *Edentes*, from their Office of eating, or chewing. They are fixed in their *Alveoli*, three manner of Ways.

The first and chief is by their Articulation with the Jaw-bones, by *Gomphosis*.

The second is, by the Nerve which is inserted into their Root by *Syneurosis*.

And the last is, by the Gums, which cleave to the outside of their Roots by *Syssarcosis*.

Their *Substance* is the hardest of all other Bones, but more especially that Part of them that stands out naked above the Gums. This Part, *Dr. Harvey* thinks ought to be esteemed rather stony than bony, and yet not the whole of it neither, but only the outside, or *cortex*, which like a Shell covers the Bony; which being broken off, or decayed, the Bony quickly rots, and moulders away: Upon which account it is, that when the Gums are eaten away, so that some part of the Tooth, which is not defended with this stony *cortex*, is laid bare, it is eroded; when that Part that naturally stands out of the Gums, and is by such a solid Substance secured, suffers no such Injury; the stony Part is not covered with any *Periosteum*, but that Part which is within the Sockets of the Jaw-bones, is invested with a thin Membrane; which, he says, is not the true *Periosteum*, (though that invests the Socket wherein they stand) but is propagated from that Membrane that covers the Gums, and is common to the whole Mouth, which does not terminate with the Gums, but when it comes to their extreme Edge, turns in, and is reflected between the other side of the Gum, and the Tooth, descending into the *Alveolus*, or Socket, and adhering on one side, immediately to those Parts of the Teeth which lie within; and on the other, to the hard fleshy Substance of the Gums, which with this, is communicated to the Roots of some Teeth (especially in the upper Jaw) to fasten them more firmly in their Sockets; and where none of this hard Flesh intervenes, it coalesces, as it were, into one Membrane with the *Periosteum*, that covers the inside of the Socket. By this Membrane, and the Nerve inserted into the Root of every Tooth, these lower Parts of the Teeth become exquisitely Sensible.

The Grinders have a manifest *Cavity* within (but the *Incisores* and *Canini*, but an obscure one) whereinto by the very small Holes of their Roots, they each receive a Capillary Artery from the *Carotides*, a Vein from the Jugulars, and a Twig of a Nerve from the fifth Pair. The Vein, Artery, and Nerve are united together, and clad with a common Membrane when they enter the Jaw, within which they have a proper Channel to run along in, under the Roots of the Teeth, sending Twigs to each, as they pass under them.

The Rudiments, or *Principles* of the Teeth, are bred with the other Parts of the Womb, but lie hid for some Months within the Jaws and Gums: These Principles are partly Bony, and partly Mucous, and both Parts are at first included in a Membranous, and somewhat Mucous *Folliculus*, or Case, which in Process of Time they break through (some sooner, other later) their Bony Part ascending upwards out of the Gums; and their Mucous Part (hardening by degrees) descending downwards into the Jaw so far as there is space for it; the *Folliculus* it self turning to a kind of Cement, whereby the Tooth is fastened to the sides of the *Alveolus*.

At what time, and at what order, they break forth out of the *Alveoli*, is known to every Nurse: Omitting therefore to speak of that, I shall only Note, That the Teeth alone, of all the Bones in the Body, continue to grow so long as a Man Lives (and they continue in his Head) for else they would be soon worn to the Scrumps by their daily Use; and we see that when a Tooth is lost out of either Jaw (in the oldest People) that which

is opposite to it in the other Jaw, will commonly grow longer than the rest, having none to grind against: Though it must be confest, that the seeming length of old Peoples Teeth, is more owing to the falling away of their Gums, than the growth of their Teeth.

When Children come to be seven or eight Years old, they change several of their Teeth; but very rarely, if ever, all. The *Incisors*, or Fore-teeth; the *Canine*, or Eye-teeth; and the foremost Double-teeth most change; but the rest of the Double-teeth very few. Now concerning this changing of the Teeth, we must know, that the Old ones do not come out by their Roots, but their upper Part only drops off, their Roots remaining still in the Socket of the Jaw; which (being like Seed for the new ones) by degrees grows up above the Gums, to supply the Place of that which is fallen off. Commonly about the twentieth Year (or upwards) there spring out two Double-teeth behind the rest, which till then, had lain hid in their Sockets. These are called *Genuine Teeth*, or *Dentes Sapientie*; because Men are then come to Years of Discretion.

As for the Number of them, commonly there are found sixteen in each Jaw; if there fall out any difference in Number, as to individual Persons, it generally falleth out in the *Molares*.

There are three Ranks, or Sorts of Teeth.

Those of the *first* Rank (for the foremost) are called *Incisors*, Cutters. Most commonly four are found in each Jaw; they have but one Root, or Fang; and so easily fall, or are pulled out. These first make way out of the Gums in Children, because the Tops of them are sharpest.

Those of the *second* Rank, are called *Canini*, or Dog-teeth, from their length, hardness, and sharpness above the rest: In each Jaw there are two; at each side of the Cutters, one. They are otherwise called *Eye-teeth*, either from an Opinion that their Roots (*viz.* of the upper) reach as far as the Eyes, or that the same Nerve that moves the Eye, sends a Twig to these Teeth; neither of which Concepts are true: The Roots of these are single, as those of the *Incisors*, but they are both sometimes crooked; and if such People in whom they are so, chance to have one of them drawn, they can hardly be pulled out, without breaking off a Piece of the *Alveolus*, in which they are fix'd.

Those of the *third* Rank, are called *Molares*, Grinders, because, like Mill-stones, they grind the Meat. Most commonly they are twenty in Number, five in each side of both Jaws. The two foremost that stand next to the Dog-teeth, are less than the rest, having but two Knobs at the Top; but the three hindmost are larger, and have four, being in a manner Four-square.

The two foremost also, have but two Roots at most; but the three hindmost commonly three or four. But those of the upper Jaw, have for the most part, one Root more than those which are opposite to them in the lower; or however their Roots are larger.

The Reason whereof may be,

First, Because they are Pendulous, and so are the apter to drop out: And,

Secondly, Because the Substance of the upper Jaw is not so firm, as that of the lower.

The Use of the Teeth, is principally to chew the Meat, to prepare it for the Stomach, that it may the easier concoct it into Chyle. The *Incisors* bite of the Morfel, the Dog-teeth break it, and the Grinders make it small; wherefore they are flat in the Top, that they may the better receive and keep the Meat; and rough, that they may grind it the better. The Teeth contributes also to the Formation of the Speech, especially the Fore-teeth; for those that have lost them, Lisp, as we say, and cannot pronounce plainly such Syllables as have C, X, &c.

TEINT, is a French Term in Painting, signifying that Artificial Colour, of which any Object is compos'd.

TELEPHIUM, is the same Ulcer with *Chironia*, (which see;) it is so called from one *Telephus*, who was a long time troubled with this Disease. *Blanchard.*

TELESCOPE, is an *Optick* Instrument which serves to discover Objects at a Distance.

If a Telescope consists only of a Convex Object-glass and an Eye-glass of a much greater Convexity, (or which is a Portion of a much lesser Sphere) than the Object-glass is, (which is the common Form of the Telescope for the Night.) Then will the apparent Magnitude of the Object seen through it, be to the Object seen by the naked Eye at the Station of the Object-glass: as the Focal Length of the Object-glass, to the Focal Length of the Eye-glass. *Molineux Dioptr. Nov. Prop. LXII.* Thus,

Suppose the Focal Length of the Object-glass be 12 Foot, or 144 Inches, and that of the Eye-glass 3 Inches; then the apparent Diameter of the Object seen through the Glass, to that seen by the naked Eye, will be as :: 144 to 3, or as 48 to 1. Wherefore such a Telescope will be said to magnifie the Diameter of the Object 48 times, and its Surface 2344 times (*i. e.* the Square of 48.)

Wherefore if the same Object-glass be combin'd with an Eye-glass, whose Focus is 1: and at another time with an Eye-glass whose Focus is 2. the former Telescope will magnifie twice as much as the latter.

Also, if two Telescopes have different Lengths, and the Focus of the Eye-glass of the *Shorter* be in the same Proportion to the Focus of its Object-glass: as the Focus of the Eye-glass of the *Longer* bears to its Object-glass; then those two Telescopes will magnifie alike.

But yet long Telescopes are of very great Use, and 'tis impossible to make short ones perform as well: For,

1. Object-glasses of a shorter Focus, will not bear Eye-glasses proportionally short, without colouring the Object, or rendering it dark and obscure.

For Instance: Suppose a very good 12 Foot Object-glass will receive an Eye-glass of no shorter Focus than 3 Inches, with clearness and distinctness; yet however an Object-glass of 24 Foot, equally good, will bear an Eye-glass of less than 6 Inches Focus (perhaps of 5 or 4 Inches Focus) with equal clearness and distinctness.

And then, tho' an Object-glass of 12 Foot, with an Eye-glass of 3 Inches will magnifie but 48 times, as is above proved; yet an Object-glass of 24 Foot, with an Eye-glass of 4 Inches, will magnifie

nise 72 times; which is nearer one third more than the former; and this is a vast Advantage.

2. The Image of the Moon, or other Object, in the distinct Base of an Object-glass of 24 Foot, is twice as long as the Image of the distinct Base of an Object-glass of 12 Foot: And consequently the Image in the former will be much more plain and distinct.

Hence may be concluded also, That if the Object-glass be formed on a less Sphere than the Eye-glass, the Appearance of Objects will be diminished in the aforesaid Proportion; as is plain by the Case, when a Telescope is inverted.

Therefore all Persons which relate Phenomena, observed by their Telescopes, or Microscopes, ought to mention not only the Length of the Tube in general, but also to express the particular Focus of both Eye-glass and Object-glass, together with the Aperture of the Object-glass; or else one cannot well judge of the Degree of magnifying.

To determine the Angle received by a Telescope of this Form, Mr. Molineux gives this Rule.

As the Distance between Object and Eye-glass, is to half the Breadth of the Eye-glass :: Radius to the Tangent of the Angle.

If a Telescope consist of a Convex Object-glass, and 3 Convex Eye-glasses, (which is the usual Form of Telescopes to be used by Day:) Then the Distance between the first Eye-glass and the second, must be the Sum of their Foci; the Distance between the second and third Eye-glasses, must be also the Sum of their Foci; so that all the Glasses are distant from the next adjacent Glasses the Sum of their Foci; only indeed there may be some little Variety in the Distance between the first and second Eye-glass; which is the Reason there is a Draw always made there, to alter it at pleasure.

This Telescope is only a double one of the former Sort, and as the former Inverts the Objects, this Inverts that Inversion, by the Addition of two more Glasses, and consequently represent all things Right, or makes them appear Erect.

Telescopes may be made with Concave Eye-glasses, but then the Area of the Object will be proportioned always to the Breadth of the Pupil of the Eye of the Beholder; whereas in a Convex Eye-glass, 'tis determin'd by the Breadth of that Glass.

The practical Rule for combining, or putting together this Day-Telescope of Four Glasses, is this:

Take the two first Eye-glasses, and combine them by Trials, so as to make a distinct inverted Telescope, consisting of a Convex-object-glass, and a Convex Eye-glass of a less Sphere.

Then take the Object-glass, and first Eye-glass, and combine them by Trials also.

Lastly, Take both these Telescopes, and without altering the Distances of their Glasses, in either of them singly; by Trials combine both these Telescopes, till the Appearance be clear and distinct.

But what is here done by Trials, may be effected by actual Mensuration, or designing out the Distances of the Glasses from each other, by knowing their Focal Distances.

TELESCOPE Aerial, so Mr. Ch. Hugen calls a Telescope, (described in *Phil. Transf.* Numb. 161.) which was made for the Night, and to be used without a close Tube, (because there is no need of one in a dark Night) and by that means a long Telescope becomes much lightened; and more easily manageable.

TELESCOPE Reflecting, of Sir Isaac Newton, is made thus: The Tube of it, which is large, is open at the end, which respects the Object; the other end is close, where a concave metalline *Speculum* is laid; and near the open end, there is a flat oval *Speculum* made as small as may be, the less to obstruct the entrance of the Rays of Light into the Tube by it, and inclined towards the upper part of the Tube, where is a little Hole furnished with a small *Plane Convex* Eye-glass: So that the Rays coming from the Object, do first fall upon the Concave placed at the bottom of the Tube, and are thence reflected to the upper end of it, where they meet with the flat *Speculum* obliquely posited, by the Reflection of which they are directed to the little *Plano-convex* Glass, and so to the Spectators Eye, who looking downwards, sees the Object which the Telescope is turned to. This Instrument is described more at large in *Philos. Transf.* N. 81.

After this first Essay, the learned Inventor made another Instrument of the same Nature, with which he saith, that he could read in the *Philosophical Transactions* opened in the Sun-shine, at an hundred Foot distance, and discern some of the Words at the distance of 120; its Aperture (define next the Eye) was then equal to above an Inch and $\frac{1}{2}$ of the Object Metal.

The Advantages of this Telescope would be very great, if it could be brought to its desired Perfection. But it is liable to two Inconveniences. First, That 'tis not very easie by it to find the Object you would see; though this a little Use and Practice would obviate; at least, placing a small Prospect-Glass on the outside parallel to the Axis of the Caviry of the Catoptrick Tube, you might readily enough find the Object by that, and then the Tube it self would be right. The 2d and much greater Inconvenience is the concave metalline Object *Speculum* being subject to Tarnish, so that it will not continue long good. But if any Person could be so happy as to find out a good metalline mixture that would polish finely, reflect vividly, and hold without rusting or tarnishing, it would be a Discovery of very great Advantage, both to Telescopical and Microscopical Improvements.

TELESCOPICAL-Stars, are those that are not visible to the naked Eye, but discoverable only by the Help of a Telescope.

TEMPERATE Zone.

TEMPORALIS, also *Crotaphites*, is a Muscle of the upper Jaw, which has a large Semicircular fleshy beginning, from part of the *Os Frontis*, *Sincipitis*, *Sphenoides*, and *Temporalis*; from these Places its Fibres pass (like Lines drawn from a Circumference to a Center) under the *Os Jugale*, from whence also arise some fleshy Fibres joining with the former at their united, partly tendinous, and partly fleshy Insertion, to the upper part of the *Processus Corone* of the lower Jaw: This, with its Partner, draws the lower Jaw upwards.

TEMPORARUM Ossæ, are Bones of the Scull situated in the lower part of the sides of the *Cranium*; their upper part, which is thin, consisting only of

one Table, is of a circular Figure, and is joined to the *Ossa Parietalia* by the *Sutura Squamosa*; their lower part, which is thick, hard, and unequal, is joined to the *Oss Occipitis*, and to the *Oss Sphæroides*, this part is called *Oss Petrosum*; they have each three external *Apophyses* or *Processes*, viz. *Processus Zygomaticus*, *Mammillaris* or *Mastoidæus*, and the *Processus Styloformis*, and one Internal. In the temporal Bones, there are 2 Internal, and 4 External Holes. The first of the Internal, is the Hole thro' which the Auditory Nerve passes; the second is common to it and the *Oss Occipitis*; the 8th pair of Nerves, and the lateral *Sinus* passes through it. The first of the External, is the *Meatus Auditorius Externus*; the second is opened behind the Palate, it is the end of that Passage which comes from the Barrel of the Ear to the Mouth. The 3d is the Orifice of the Conduit, by which the Carotid Arteries enter the *Cranium*; and the fourth is behind the *Processus Mastoidæus*; by it passes a Vein which carries the Blood from the external Teguments to the lateral *Sinus*; sometimes this Hole is wanting; there is another which is between the *Processus Mastoidæus*, and the *Styloformis*, thro' which the *Portio dura* of the Auditory Nerve Passes. They have each a *Sinus* lin'd with a Cartilage under the *Meatus Auditorius*, which receives the condyle of the lower Jaw.

TEMPORARY Fortification. See *Fortification*.

TENAILLE, in Fortification, is a kind of Out-work resembling a *Horn-work*, but generally somewhat different, in regard that instead of two Demibastions, it bears only in Front a Re-entring Angle between the same Wings without Flanks; and the Sides are parallel: But when there is more breadth at the Head than at the Gorge, these *Tenailles* are called *Queue d'Yrlande*.

TENAILLE Double or Flank'd, is a Work whose Front consists of four Faces, making two Re-entring Angles, and three *Saliant*; the Wings or Sides of this Work being in the like manner correspondent to the Front of the Gorge.

TENAILLE Simple, is a Work having its Front form'd by two Faces, which make a Re-entring Angle, the Sides running directly parallel from the Head to the Gorge.

TENAILLE of the Place, is that which is comprehended between the Points of two neighbouring Bastions; that is to say, the *Curtain*; the two *Flanks* that are rais'd on the Curtain, and the two Sides of the *Bastions* which face one another: So that 'tis the same with what is otherwise called, *The Face of a Fortrefs*.

All *Tenailles* are defective in this respect, That they are not Flanked or Defended towards their inward or dead Angle; because the height of the Parapet hinders seeing down before the Angle, so that the Enemy can lodge himself there under Cover: Wherefore *Tenailles* are never made but when they want time to make a *Horn-work*.

TENANT, or *Tenant*, is one that holds or possesses Lands or Tenements by any kind of Right, either in Fee for Life, Years, or at Will. And 'tis used in Law, with divers Additions, as *Tenants in Dower*, which is she that possesses Land by Virtue of her Dower.

Tenant per Statute-Merchant, that holds Land by Virtue of a Statute forfeited by him.

Tenant in Frank-Marriage, is he that holds Lands or Tenements by Virtue of a Gift thereof

made to him upon Marriage between him and his Wife.

Tenant by the Courtessie, that holds for his Life, by reason of a Child begotten by him of his Wife, being an Inheretrix, and born alive.

Tenant by Elegit, that holds by Virtue of the Writ called an *Elegit*.

Tenant in Mortgage, that holds by means of a Mortgage.

Tenant by the Verge, in ancient Demesne, is he that is admitted by the Rod in the Court of ancient Demesne.

Tenant by Copy of Court-Roll, is one admitted Tenant of any Lands, &c. within a Manor, which Time out of Mind, have been demisable, according to the Custom of the Manor.

Tenant by Charter, is he that holdeth by Feoffment in Writing, or other Deed.

Tenant in Chief, that holdeth of the King in Right of his Crown.

Tenant of the King, is he that holds of the Person of the King, or as to some Honour.

Very Tenant, that holds immediately of his Lord: For if there be Lord, *Mesne* and *Tenement*, the *Tenant* is *very Tenant* of the *Mesne*, but not to the Lord above.

Joint-Tenants, that have equal Right in Lands and Tenements, by Virtue of one Title.

Tenants in Common, that have equal Right, but hold by divers Titles.

Particular Tenant, that holds only for this Term.

Sole Tenant, is he that hath no other joined with him.

Several Tenant, is opposite to *Joint-Tenants*, or *Tenant in common*.

Tenant al Præcipe, is he against whom the Writ *Præcipe* is to be brought.

Tenant in Demesne, is he that holdeth the Demesne of a Manor for a Rent without Service.

Tenant in Service, is he that holdeth by Service.

Tenant by Execution, is he that holds by Virtue of an Execution upon any Statute, Recognisance, &c.

There was also, *Tenant by Knight-Service*, *Tenant in Burgage*, *Tenant in Socage*, *Tenant in Frank-fee*, *Tenant in Villenage*. And there is *Tenant in Fee-simple*, *Tenant in Fee-tail*, *Tenant upon Suffurance*, &c.

TENAR, (the same with the *Abductor Pollicis*) is with some, the Name of the Muscle which serves to draw the Thumb from the Fingers.

TENASMUS. See *Tenismus*.

TENDER, in a legal Sense, signifies as much as carefully to offer, or circumspectly endeavour the Performance of any thing belonging to us. As to *tender Rents*, is to offer it at the Time and Place where and when it ought to be paid. To *tender his Law of Summons*, is to offer himself ready to make his Law, whereby to prove that he was not Summoned.

TENDON, is a similar nervous Part annexed to Muscles and Bones, whereby the voluntary Motion of the Members is chiefly performed. The Generality of Surgeons scarce ever distinguish betwixt a *Tendon* and a Nerve.

TENEMENT, signifies the House or Land that a Man holdeth of another, and when join'd with *Frank*, it contains Lands, Houses and Offices, where-

wherein we have Estate for Term of Life, or in Fee.

TENEMENTIS *Legatis*, is a Writ that lies to London, or any other Corporation, (where the Custom is, That Men may demise Tenements as well as Goods and Chattels by their last Will) for the Hearing any Controversie touching the same, and for rectifying the Wrong.

TENENTIBUS *in assis non onerandis*, &c. is a Writ that lieth for him to whom a Disseisor hath alienated the Land whereof he disseiseth another, that he be not molested for the Damages awarded, if the Disseisor have wherewith to satisfy them himself.

TENESMUS, *Tenasmus*, is a continual Desire of going to Stool, yet attended with an Inability of doing any thing, but sometimes voiding of bloody and slimy Matter. *Blanchard*.

TEN-FOOT Rod. See *Station-Staff*.

TENNY, or *Tawny*, the Herald's Term for a bright Colour made of Red and Yellow mixed; and is expressed in Engraving by thwart Strokes or Hatches like *Purple* in the Coats of all below the Degree of Noble, 'tis called *Tenn*, but in those of Nobles 'tis called *Hyacinth*, and in Princes Coats by the Name of the *Dragon's Head*.

TENOR, is the Name of the first Mean or middle Part in Music.

TENORE *indictamenti mittendo*, is a Writ whereby the Record of an Indictment and the Process thereupon is called out of another Court into the *Chancery*.

TENSORS, or *Extensors*, are those common Muscles that serve to extend the Toes, and have their Tendons inserted into all the lesser Toes.

TENTHS, is that yearly Portion or Tribute which all Ecclesiastical Livings pay to the King.

TENURE, a Term in Law, signifying the manner whereby Tenements are holden of their Lords; what may make a *Tenure*, and what not. See *Perrkins Cap. 10. Reservation 70*, where you'll find most of those *Tenures* that are now used in *England*.

TEREBRUM. See *Mediolus*.

TERES Major, is a Muscle which arises from the inferior Angle of the *Scapula*, and becoming a round fleshy Body, ascends obliquely with the former, but then passeth under the superior Head of the *Gemellus*, and makes a short flat Tendon, inserted below the Neck of the *Os Humeri*, close to that of the Muscle called *Aniscaptor* or *Latissimus Dorsi*.

TERES Minor, is a Muscle of the Arm, so called from its Figure and Magnitude; to distinguish it from the *Terres Major*.

This Muscle is in some Bodies confounded with the *Infraspinatus*, but in others it is distinct. It arises fleshy from the lower Part of the inferior Costa of the *Scapula*, and descends obliquely over the superior Head of the *Gemellus Major*, where becoming tendinous, it is inserted to the Head of the *Os Humeri*: When this acteth, the Arm is moved backwards and downwards.

TERGIFOETOUS Plants, such Herbs (as the *Capillaries*) as bear their Seeds on the back sides of their Leaves, are for that reason called by some Botanists *Tergifetae*.

TERM, in Geometry, is sometimes taken for the Bounds and Limits of any thing; as a Point is the Term of a Line, a Line of a Superficies, and a

Superficies of a Solid: And this is what the Schools call *Terminus Quantitatis*.

TERM, in Law, signifies the Bounds and Limitation of Time, as a Lease for Term of Life or Years. But 'tis most commonly used for that Time wherein the Tribunals or Places for Judgment are open to all that think fit to complain of Wrong, or to seek their own by due Course of Law, or Action; the rest of the Year is called *Vocation*.

Of these Terms there be Four in every Year, during which Time Matters of Justice are dispatched.

One is called *Hillary Term*, which begins the 23d Day of January, or if that be Sunday, then the next Day after, and endeth the 12th of February following.

The Second is *Easter Term*, which begins the Wednesday Fortnight after *Easter-day*, and ends the Monday next after *Ascension-day*.

The Third is *Trinity Term*, beginning the Friday next after *Trinity-Sunday*, and ending the Wednesday Fortnight after.

The Fourth is *Michaelmas Term*, which begins the 23d of October, unless it be Sunday, and then the Day after, and ends the 28th of November following.

TERMINTHUS, is a Swelling in the Thighs, with a black Pimple at the top as big as the Fruit of the Turpentine-Tree. *Blanchard*.

TERMS of an Equation in Algebra, are the several Names or Members of which it is composed, and such as have the same unknown Letter, but in different Powers or Degrees. For if the same unknown Letter be found in several Members in the same Degree or Power, they all pass but for one Term.

Thus in this Equation $aa + ab = R$, the three Terms are, aa , ab and R .

And in this, $aa + ab + ac = R d + d c$; the Terms are aa , $ab + ac$, and $R d + d c$; which are but 3, because $ab + ac$, having a in the same Dimensions in both Parts, is taken but for one Term. Hence the first

Term in any Equation must be that, where the unknown Root hath the highest Dimensions; and that Term which hath the Root in it of one Dimension of Power lower, is called the *second Term*, and so on.

Des Cartes shews a Method of taking away the second Term of any Equation, and the Method is very well known, and in common Use. But there is one D. T. mentioned in the *Acta Eruditorum*, May 1683, which gives a general Analytical Method for taking away all the intermediate Terms of an Equation; which (he saith) was never done before, and was thought Impossible by many.

TERMS of Proportion, in Mathematicks, are such Numbers, Letters or Quantities, as are compared one with another.

Thus if $4.8::6.12$ then a, b, c, d ; or $4, 8, 6, 12$, are called the Terms; of which a is called the first Term, b the second Term, &c. a and c are called the two Antecedents, and b and d the two Consequents.

TERRA *Damnata*. See *Earth*.

TERRA *extendenda*, is a Writ directed to the Escheator, &c. willing to enquire and find out the true Yearly Value of any Land, &c. by the Oath of Twelve Men, and to certify the extent into the *Chancery*, &c.

TERRA

TERRAQUEOUS, in Geography, signifies the Globe of Earth and Water, as they both together constitute one Spherical Body.

TERRE-PLAIN, in Fortification, is the Platform or Horizontal Surface of the Rampart lying level, only with a little slope on the outside for the Recoil of the Cannon.

It is terminated by the Parapet on that Side toward the Field, and by the *Inner Talus* on the other toward the Body of the Place.

TERRE-Tenant, is he who has the actual Possession of the Land, which otherwise is called *Occupation*.

Thus a Lord of a Manor hath a Free-holder, who letteth out his Free-hold to another to be Occupied.

This Occupier (having the actual Possession) is called the *Terre-Tenant*.

TERELLA: When a Loadstone is turned into an exact Spherical Figure, and is placed so that its Poles and Equator, &c. do exactly correspond to the Poles and Equator of the World; it is called by *Gilbert pureszyn*, or *Terrella*, a little Earth; because it is a very just Representation of the Great Magnetical Globe which we inhabit.

It was believed that such a Terrella as this, if nicely poised and placed in a Meridian, like a Globe, would be turned round in 24 Hours, as the Earth is by the Magnetick Particles that pervade it; but this by plain Experience is to be found a Mistake.

TERRESTRIAL Globe. See *Globe*.

TERRESTRIAL Line. See *Line Terrestrial*.

TERRIS, *bonis & cattallis rehabendis post purgationem*, is a Writ that lies for a Clerk, to recover his Lands, Goods or Chattels, formerly seized, after he hath cleared himself of that Felony, upon Suspicion whereof he was formerly Convicted, and delivered to his Ordinary to be purged.

TERRIS & cattallis tentis ultra debitum levatum, is a Writ Judicial, for the restoring of Lands or Goods to a Debtor that is Distrained above the Quantity of a Debt.

TERRIS Liberandis, is a Writ that lies for a Man Convicted by Attaint, to bring the Record and Process before the King, and to take a Fine for his Imprisonment, to deliver him his Lands and Tenements again, and to release him of the *Strip* and *Waste*.

It is also a Writ for the Delivery of Lands to the Heir after Homage and Relief performed, or upon Security taken, that he shall perform them.

TERSION, is Wiping or Cleansing the outside of any Body.

TERSOR. See *Latissimus Dorsi*.

TERTIAN *Ague*, or Fever, is that which intermits intirely, and then returns again every third Day inclusively.

TERTIATE: To Tertiate a Great Gun, is to know the thickness of the Metal at the Touch-hole, the Trunnions, and at the Muzzle; by which to judge of the Strength of a Gun, or whether it be well *Fortified* or not. This is usually done with a Pair of Calliper Compasses; and if the Piece be *Home-bored*, the Diameter less by the height divided by 2 is the Thickness at any Place.

TEST, the same as the *Cuppel*, or Coppel, an Instrument used by Chymists and Refiners, to purifie Gold or Silver. See *Cuppel*.

TESTACEOUS *Fishes*, are such whose strong and thick Shells are entire and all of one piece; as the Oyster, Escollop, Cockle, &c. But those whose Shells are softer and thinner, and which are divided into distinct Joints, and composed of several Pieces, such as Lobsters, Crawfish, Crabs, &c. are called *Crustaceous Fishes*.

TESTAMENT, is the Last Will or Declaration of the Mind of a Person deceased; and is of two kinds, *viz.* A *Testament in Writing*, and A *Testament in Words*, which is called a *Nuncupative Testament*; which is, when a Man being Sick, and for fear lest Death, want of Memory, or Speech, should come so suddenly upon him, that he should be prevented if he stay'd the Writing of his *Testament*, desires his Neighbours and Friends to be Witnesses of his Last Will, and then declares the same before them by Words, which after his Decease, is proved by Witnesses, and put in Writing by the Ordinary, and then stands in as good Force as if it had at the first, in the Life of the Testator, been put in Writing, except only for Lands, which are devisable but by a *Testament* put in Writing in the Life of the Testator.

TESTATUM, is a Writ in Personal Actions, as if the Defendant cannot be arrested upon a *Capias* in the County where the Action is laid, but is returned *non est inventus* by the Sheriff.

The Writ shall be sent into any other County, where such Person is thought to have wherewith to satisfy; and is called a *Testatum*, because the Sheriff hath formerly testified, That the Defendant was not to be found in his Bayliwick.

TESTE, is a Word commonly used in the last Part of every Writ, wherein the Date is contained, which begins with these Words, *Teste meipso*, &c.

TESTES; the Testicles of a Male are justly reckoned among the principal Parts, because they are necessary to the Conservation of the *Species*.

But before I proceed to an Anatomical Description of them, 'tis necessary to say something of the *Vasa Preparatoria*, which prepare the Matter out of which the *Semen* in the Testicles is elaborated; as I shall afterwards describe the *Vasa Deferentia*, that so the Reader may have this great and wonderful *Apparatus* all before him at one View.

In Man, some of the *Vasa Preparatoria* afford Matter for the *Semen*, as the *Arteriae Spermaticae*; others bring back again the Blood that is superfluous, to the making of the *Semen*, and to the Nourishment of the Testicles; and these are the *Venae Spermaticae*; and both these Arteries and Veins were formerly called *Vasa Preparatoria*: Some make the *Semen*, as the Testicles; some convey it from thence to its Conservatory or Store-house, as the *Vasa Deferentia*: Some contain the *Semen* till the time of Copulation, and these are the *Vesiculae Seminales*: Some discharge the *Semen* into the Matrix in Coition; this is done by the *Penis*; and some, lastly, moisten the Passage (*viz.* the *Urethra*) whereby the *Semen* issues, and those are the *Prostrates*. Of all which in Order. And first of the

Vasa Preparatoria, which are said to prepare Matter for the *Semen*, these are of two sorts, *Arteries* and *Veins*.

The *Arteries* are two, and spring from the Trunk of the *Aorta*, commonly two Fingers breadth under the Emulgents, not from its Side, but out of its Fore-part, the right whereof climbing over the Trunk

Trunk of the *Vena Cava*, runs obliquely to the Vein of that same Side; as also the left, marches to the Vein of that Side.

The *Veins* are also two. The right arises usually from the Trunk of the *Vena Cava*, a little below the Emulgent; the left from the Emulgent itself, for otherwise it must have gone over the *Aorta*, whereby it might have been in Danger of breaking; or rather, by the continual Pulse of the Artery, the Recourse of the Venal Blood might have been retarded.

Now both these Veins and Arteries, a little after their rise, meet, and are invested both in one Membrane, made of the *Peritoneum*, and then run straight through the Region of the Loins above the Muscles *Psoæ* on each side, and above the *Ureters*, as they go, bestowing little Slips here and there upon the *Peritoneum*, between whose Duplication they descend, and so arrive at its Processes. The Veins divide very often into many Branches, and by and by inosculate and unite again; but the Arteries go along by one Pipe only on each side, until within 3 or 4 Fingers breadth of the Testicles, where each is divided into two Branches, the less whereof runs to the *Epididymis*, the larger to the Testicle; and as I said, they descended between the Membranes of the *Peritoneum*, so they pass into the *Scrotum* between them, not perforating the inner in the Processes, as in Dogs and other Creatures, wherein the Processes of the *Peritoneum* are hollow like a Quill; but in Man, the inner Membrane of the *Peritoneum* shuts the Hole, lest the Intestines fall by it into the *Scrotum*; of which there is greater danger in him, (and we see it often happen) because of his going upright. But to return to the *Vasa Preparatoria*.

It has been generally taught, That there are divers Inosculations of the Arteries with the Veins in their Passage, whereby the Venal and Arterial Blood are mixed; but this Opinion is now exploded, for that granting the Circulation of the Blood, it is impossible: For the Blood in the Arteries descends towards the Testicles, and that in the Veins ascends from them, so that if these two Vessels should open one into the other, the Blood in one of them must needs be driven back, or else stagnating, distend and break the Vessels. But the Truth is, the Blood both for Nourishment of the Testicles, and the making of the *Semen*, flows down by the Arteries only, and that in an even undivided Course, without any of those Windings and Twirlings like the Tendrels of Veins talk'd so much of (as the Curious *de Graaf*, from his own frequent Inspection, testifies) and the Veins bring back from the Testicles what of the Blood remains from their Nourishment and making of the *Semen*; and these, indeed, come out of their inmost Membrane, by almost innumerable Roots, by which they imbibe the said Blood, and are most admirably interwoven and inosculated one with another, till about Four or Five Fingers breadth above the Testicle; which Space is called *Corpus Pyramidale*, *Plexus Pampiniformis*, or *Varicosus*.

But these Veins are so far from preparing the *Semen*, as that they only bring back what was superfluous from the making of it. And, indeed, the Arteries in Men, do no more merit the Name of *Preparatories*, in respect to the *Semen*, than the Gullet in respect to the Chyle, or the *Ductus Thoracicus Chyliferus* in regard to the Blood; for their

Blood acquires no sensible Alteration till it come to the Testicles themselves. But however, we continue the old Names, declaring only against the Reason of them. And we will only note two things more.

First, That the Spermatick Veins have from their rise to their End, several *Valves* which open upwards, and so suffer the Blood to ascend towards the *Cava*, but not to slide back again.

2dly, That tho' the Spermatick Arteries go such a direct Course in Men, as has been said; yet in Brutes they are more complicated and twitted with the Veins, but without any *Anastomoses* of one into the other.

These *Vasa Preparatoria* thus described, proceed we to the *Testes*.

These have Arteries and Veins (as is said above) from the former *Vasa Preparatoria*, which some have thought to reach only to the inmost Coat, called *Tunica albuginea*, because they are not conspicuous in the inner Substance of the Testicles. But tho' this may be true of the Veins which only receive the superfluous Arterial Blood, and have nothing to do with the *Semen*, yet it is not true of the Arteries, namely, of the most numerous branches of them. Indeed Blood is seldom seen in the Substance of the Testicles; but that comes to pass by reason that the Arterial Blood presently loses its Colour, and by the Semenifick Faculty of the *Testes* is turned into *Semen*, which being whitish, of the same Colour with the Vessels, makes them indiscernible; yet in those Men that have died of languishing Diseases, and whose *Testes* have their Faculty impair'd.

Diemerbroeck affirms, That he has oft discover'd sanguiferous Vessels in the inmost Parts of the *Testes*, and has shew'd them to many in the Publick Anatomical Theatre.

As for Nerves, *Dr. Willis* says, he could never observe more to go to them than one from a Vertebral Pair, and that too was most of it spent upon the Muscle *Cremaster*.

Diemerbroeck agrees to one Nerve, but thinks it proceeds from the sixth Pair, (which is *Dr. Willis's Intercostal*, as distinguish'd from that commonly called the Sixth, but his Eighth.) Others will have Branches from both these Nerves to go to them. Concerning the Use of these Nerves there is great Controversie. *Dr. Glisson, Wharton, &c.* will have them to convey a *Succus Genitalis*, which makes the greatest part of the *Semen*. *Dr. Willis*, as he denies (in *Cerebri Anatom. cap. 27.*) any *Succus Nutritivus* to be conveyed by the Nerves to other Parts; so that any *Succus Genitalis* is brought by them hither, but only Animal Spirits.

And whereas, to strengthen the former Opinion, 'tis usually objected, That the *Semen* must needs consist of a Nervous Juice, and plenty of Spirits brought from the Brain, because of the great Debility and Enervation that is induced upon the Brain and Nerves, by the too great Expence of it. He thus answers, That this comes to pass, because after great Profusions of the *Semen*, for the repletion of the same Humour, (whereof Nature is more solicitous, than for the benefit of the Individual) a greater tribute of Spirituous Liquor is required from the Blood, to be bestowed on the Testicles. Wherefore the Brain being defrauded of

of a due Income and Afflux of the said Spirituous Liquor, languishes; and so the Animal Spirits failing in the Fountain, the whole Nervous System becomes depauperated and flaggy. Whereto may be added, That also the Animal Spirits themselves that actuate the *Prostates*, being derived from the Spinal Marrow, are much wasted by Venereal Acts: So that for this Reason besides, the Loins are enervated.

In this Answer *Bartholin* acquiesces: And *de Graef*, *Diemerbroeck*, &c. confess, indeed, That the Spirituous Arterial Blood is impregnated with Animal Spirits from the Nerves; but affirm, That the Matter out of which the *Semen* is elaborated, is only the said Blood; and to these we subscribe.

Lympheducts they have also a rising from betwixt their Coats, and ascending upwards into the *Abdomen* under the *Vasa Deferentia*. These have many Valves looking upwards, which hinder any thing from descending by them to the *Testes*, but permit the *Lympha* to ascend, which they convey into the Chyliferous Vessels. *Malpighi* thinks it probable that some fall is derived to the Seminary Vessels for the Generation of the *Semen*, or at least to be mixed with it, seeing most Creatures grows the fatter upon being Castrated.

They have two sorts of Coats, Proper, and Common. The Common invest both the *Testes*, (constituting the *Scrotum*) and are two, The outermost consists of the *Cuticula* and true Skin (here thinner than in other Places.) It is soft and wrinkled, and is generally affirmed by Anatomists to be without Fat. On the outside it has a Suture or Seam that runs Lengthways of the *Scrotum*, and divides it into the Right and Left side. The other or inner common Coat, is a carnosous Membrane, which seems to be Muscular, because of the Power it has to contract and wrinkle it self. It is called *Jugros*, and adheres to the proper Coat next under it (call'd *Vaginalis*) by many Membranous Fibres.

This is the common Account of this Part that all Anatomists have usually given; but lately Dr. *Fred. Ruysch* affirms, That it has the *Membrana adiposa* also under the *Carnosa*; or rather, That the *Carnosa* is fatty, (on the inside) as it is in other Parts of the Body. And besides, he says, that in the *Scrotum*, there is a *Septum* within dividing it into two Parts; of which, says he, you have nothing in *Vesalius*, *Bartholin*, *de Graef*, &c. Men that have otherwise deserved very well of Anatomy: And what wonder, seeing all things about the *Scrotum* of one newly dead, are so slippery and moveable, that the true Constitution of the *Septum* can hardly appear. Wherefore, if any one would demonstrate this, the *Scrotum* is to be blown up, and to be cut open after 'tis dried, by which means the *Septum* yields it self to view, and has an Infinity of Blood-vessels running through it.

Thus he: This *Septum*, *Verheyen* says, is the same Substance with the carnosous Membrane above described, from which it seems to arise in the same manner as the *Mediastinum* from the *Pleura*. To each side of it the *Testes* are firmly knit, by means of their outer Proper Coat, and its Use is partly to sustain the *Testes*; and to hinder them from hitting against one another; and partly to help the carnosous Membrane to wrinkle, and purse up the *Scrotum*.

The proper Coats are also two, and these enclose each Testicle apart. The outer is called *Elitroides*, or *Vaginalis*; because it contains the Testicle as a *Sheath*. It is a thick and strong Membrane, having many Veins; in the outside it is uneven, by reason of the Fibres, by which it is knit to the *Dartos* and *Septum*; but in the inner side it is smooth. This is nothing else but the production of the *Peritonæum*, even as the *Scrotum* is of the Skin and *Membrana carnea* of the *Abdomen*. Into this Coat is inserted the Muscle *Cremaster*, of which presently.

The inmost is *reueóñs*, the *Nervous Membrane*, called *Albuginea*, from its Colour. It is white, thick and strong, framed of the External Tunicle of the *Vasa preparantia*: It immediately enwraps the Testicles, towards which it is rough, but on the outside next the *Vaginalis*, it is smooth; and between these two, the Water is contained in an *Hernia aquosa*.

Into the outer of the proper Membranes (as was said) is inserted the Muscle *Cremaster*. These Muscles (to each Testicle one) have their Rise from the *Os Pubis*; and almost encompassing round the Processes of the *Peritonæum*, descend with them to the Testicles; where their Carnous Fibres run through the whole length of this same *Tunica Vaginalis*, especially in its lower Part, and so keep the Testicles suspended, from whence they have their Name (from *ὑψεύζω* *Suspendo*) from their spreading themselves thus on the outer side of the outer proper Coat.

Riolanus reckons them for a third proper Coat, calling it *Erythroides*; and because of its Carnous Fibres, it makes the *Vaginalis* look Red; such as take it not for a distinct Coat, do give the Name of *Erythroides*, also to the *Vaginalis*, calling it by either Name indifferently. These Muscles pull up the Testicles in the Act of Generation, that the Vessels being slackened, may the more readily void the *Semen*; and at other times they help to sustain their Weight.

The Muscles in Sickness, and old Age become flaggy, and so the *Scrotum* relaxing it self, the Testicles hang low.

Upon the *Testes* as yet clad with the *Tunica Albuginea*, are fixed the *Epididymide* (called also *Parastata*, *Standers by*, or *Assistants*) enwrapped in the same Coat with the Spermatick Vessels; they adhere closer to the Testicles at their ends, than in the midst.

De Graef defines them to be Vessels making with their various Windings, that Body that is fixed on the Back of the Testicles.

To find out their Substance he directs us thus:

First, Take off the Membrane that encompasses them, and knits them to the Testicles, and then there will appear many Windings, which with the Edge of a Knife, may without hurting the Vessels be so easily separated one from another, that they may be drawn out into a length like a thing folded; for they are only folded from one side to the other, and are kept in that site, by the Membrane received from the *Tunica Albuginea*, (or Spermatick Vessels.)

But when you have unravell'd half of them, you must cut another very thin Membrane, and then you will see other Vessels lie just like these, and may be unloosed like them: And the whole

whole being unravel'd, the thicker they are by how much further from their Origin, which is implanted into the upper Part of the Testicle, by six or seven Ramifications; which having run so far, as where they join into one Duct, make it as thick as a small Thread; and this by degrees so thickens, that being encreas'd like a Chord, it makes the *Vas Deferens*.

So that (saith he) it is clear from hence:

First, That the *Testes* do not differ from the *Epididymide* (or *Parastate*) saving that those consist of divers Ducts; but these, after their six or seven Roots that arise out of the Testicle are united, (which they are in a short Space) but of one, only a little thicker.

Secondly, That the *Epididymide* differ not from the *Vasa differentia*, saving that the former go by a serpentine winding Passage, and these by a freight; and that those are a little softer and narrower.

Out of the *Epididymide* at their smaller End, arise the two *Vasa deferentia*, otherwise called *Ejaculatoria*, as if in the *Coitu*, the *Semen* were ejaculated from the *Testes* through them; which indeed was the common Opinion, till the *Vesiculae seminales* were found out, which are now known to be the Store-houses of the *Semen*, and not the *Testes*; so that the *Vasa deferentia* deserve not the Name of *Ejaculatoria*, except it be that Part of them which reaches from the *Vesiculae seminales* to the *Prostate*, through which indeed, the *Semen* is ejaculated in *Coitu*.

They are white, hardish Bodies, like a pretty large Nerve, with a Cavity not very discernible, but which may be made so, if one open one of them six or seven Fingers breadth above the Testicle, and then either blow into it with a small Pipe, or squirt some colour'd Liquor into it, with a Syringe towards the *Testes*; for then the Vessel will be distended, and the Colour will run along its Cavity towards the *Epididymide*: Or if you either blow or squirt Liquor by a Syringe, the other way towards the *Vesiculae seminales*, the said *Vesiculae* will be distended.

Now from the *Epididymide* these *Vasa deferentia* ascend, and pass out of the *Scrotum* into the *Abdomen*, the same way by which the *Vasa preparantia* came down, viz. by the Process of the *Peritoneum*. When they are entered the *Abdomen*, they are carried presently over the *Ureters*, and turning back again, they pass to the back-side of the Bladder; between which, and the *Intestinum rectum*, they march at a little Distance the one from the other, till about the Neck of the Bladder, where they grow wider and thicker; and then just as they are going to meet, their sides open into the *Vesiculae seminales*, in which they deposit the *Semen*, but not terminating here, but coming close together, and growing smaller and smaller, they go on and end at the *Urethra*, betwixt the *Prostate*. At their ending *Verheyen* (with some others) affirms there is a little *Septum* between them, with a Caruncle (which they call a *Cock's Head*) to hinder the *Semen* that comes out at one Orifice, to go in by the other; and the two Orifices by which the *Semen* is ejaculated into the *Urethra*, are called the *Eyes of the Cock's Head*.

These *Vesiculae* are little Cells like those in a Pomegranate, or something like a Bunch of

Grapes; *De Graef* compares them to the Guts of a little Bird diversly contorted; They consist of one thin Membrane, through which some small Twigs of both Veins, Arteries and Nerves run. They are about 3 Fingers-breadth long, and i broad; but in some Places broader, some narrower, as they run in and out. They are two (one for each *Vas deferens*) divided from one another by a little interstice; and they do severally by a peculiar Passage, emit the *Semen* contained in them into the *Urethra*. They are very anfractuous and winding, and (as was said) consist of many little Cells, and they should not pour out all the *Semen* contained in them in one Act of Coition, but might retain it for several: They have no Communication one with another, not even in their very opening into the *Urethra*; but the *Semen* is brought to the *Vesiculae seminales* on the right side, by the right *Vas deferens*, issues by its proper passage into the *Urethra*; and that which is brought to the left likewise; so that if by any accident the *Vesiculae*, or one side be burst, or cut (as in cutting for the Stone they generally are) yet those on the other being entire, may still suffice for Generation: Now when the Seed is emitted out of these *Vesiculae* in the Act of Coition, it passes out the same way it came in, which in this Case may easily be (though otherwise it be unusual, there should be a contrary Motion in the same Vessel) for as it comes in from the *Vasa deferentia*, it drills along gently without any force; but in *Coitu*, when the Muscles in the *Penis*, and all the bordering Parts are much tumified, it is expressed, or ejaculated out of them with some Violence, and passing along their Neck (which is a Continuation of the *Vasa deferentia*) ounces through a Caruncle into the *Urethra*, for there is one Plate as a Valve before the Orifice of each of them, partly to hinder the coming of the Urine into them, partly to hinder the involuntary Effusion of the *Semen*.

Now, though naturally, the little Holes through which the *Semen* passes out of the Necks of the *Vesiculae* into the *Urethra*, be almost imperceptible; yet if they be either eroded by the Acrimony of the *Semen* (such Acrimony as is contracted by impure Embraces, or in Claps (as they call them); or if of themselves they be debilitated and so become more lax (as sometimes happens to old and impotent Men that meddle too much) then there happens a *Gonorrhoea*, or continual efflux of the *Semen*. And so *Vesalius* and *Spigelius* have observed them much dilated, in dissecting such as have died with a *Gonorrhoea* upon them.

The *Prostate* are placed near to the *Vesiculae seminales*, *de Graef* calls them *Corpus glandulosum*, supposing them to be one Body, and only divided by the common Ducts of the *Vesiculae seminales*, and *Vasa deferentia* coming through the midst of it.

They are of a white, spongy, and glandulous Substance, about as big as a small Wallnut, encompass'd with a strong and fibrous Membrane from the Bladder to the beginning of whose Neck they are joined at the Root of the *Penis*: In shape they come nearer to an Oval, save that on their upper and lower sides, they are a little deprest, and in that end by which the *Vasa deferentia* enter, they are something hollow like a Tunnel. The Sphincter Muscle of the Bladder encompasses them so that so far as they cover the Neck of the Bladder, the Sphincter touches it not, they coming

between. They have all sorts of Vessels, which run mostly on the outer side ; in their inner Part, they have ten or more small Ducts, which all unload themselves into the *Urethra*, by the sides of the Caruncle, through which the *Semen* passes from the *Vesicula* into the *Urethra*, and themselves have each one a small one to stop its Orifice, lest the Liquor that is contained in the *Prostate* should continually flow out, or the Urine should flow in : And these small Ducts, I suppose, are continued from those *Vesiculae*, which appear in the *Prostates* of those that die (any way) suddenly after Coition. For in such the spongy part of the *Prostate* is very turgid with a ferous Liquor ; and in their inner part may be found the same *Vesiculae*, like to *Hydarides*, which if you press upon, they will discharge themselves in the above said Ducts.

What the Liquor they contain should be, or what is their Use, there is a great Variety of Opinions : Some think that the *Semen*, that flows from the Testicles, is further elaborated here : But that cannot be ; for that the *Vasa deferentia* deposit nothing in them, but all into the *Vesicula Seminales*. Others think that from the Blood there is separated in them an acrimonious, and ferous Humour, which serves for procuring the Tirillation in Coitu. As to this, *de Graef* appeals to the Taste of it, which has nothing of an Acrimony.

Dr. Wharton thinks they make a particular kind of *Semen*, as the Testicles do another, and the *Vesicula Seminales* a third ; That these last make a *Semen* different from that made in the Testicles, is grounded on a Mistake in Anatomy, viz. That the *Vasa deferentia* have no Communication with the *Vesiculae* ; whereas they apparently open into them, and deposit in them all the *Semen* they contain ; that the *Prostate* make a peculiar sort, he endeavours to prove, because castrated Animals emit some *Semen*. But that is but precarious ; for tho' they emit something, 'tis not necessary it should be any true *Semen* : Or if it be, it may well be supposed to proceed from the *Vesicula Seminales*, that were full when the Animal was castrated. For, for this Reason it has been observed, that presently after the Castration they have sometimes got the Female with Young, but not afterwards, when that Stock was spent. *Bartholin*, with many others, thinks they make an oily, slippery, and fatty Humour, which is pressed out, as there is need, to besmear the *Urethra*, whereby to defend it from the Acrimony of the *Semen*, and Urine, and lest it should dry up. This Humour *Malpighius* thinks to be conveyed hither by the *Ductus adiposi*, and quotes *Sevorinus*, affirming that he has observed a plain Vessel in the Fat of the Kidneys, tending to the Spermatick Vessels. He ascribes the same Use to it as *Bartholin*, &c. *Diermbroeck* confesses, that 'tis necessary the inside of the *Urethra* should be kept moist, and slippery, but thinks that is done here, as in the Bladder, Intestines, and many other places, from some muced Part of the Nourishment of the *Urethra* it self, and concludes that the *Vasa deferentia* deposit not all the *Semen* into the *Vesicula seminales*, but carry a smaller Part to these *Prostate*.

De Graef denies, that the *Vasa deferentia* convey any thing to them, or have any Communication with them ; and therefore believes, that the Humour that is separated in the *Corpus glandulosum* (as he calls the *Prostate*) serves for a *Menstruum*, or Vehicle of the *Semen*, which flow-

ing but in small Quantities, through small Pores into the *Urethra* ; it was necessary, that this Humour should be mixt with it, that it might the better reach the Womb. Whatever this Humour be, it is squeezed out partly by the Intumescence and Erection of the *Penis* ; and partly by the Compression of the Sphincter of the Bladder, that girds the *Prostate* about.

These *Prostates* are often (at least partly) the Seat of the *Gonorrhoea* ; and the Humour that they contain, is that which is shed.

TESTES Cerebri, are the two lower and lesser Protuberances of the Brain, so call'd from the likeness they have to Testicles. These with the *Nases* which lie above them, and the *Protuberantia Seriatæ*, are the Origin of the *Modulla oblongata*. The Uses of these *Testes* you may see in *Willis's* Anatomy of the Brain ; but they seem but conjectural.

TESTUDO, is a soft large Swelling, or not very hard, in the Head, broad, in Form of an Arch-Dome, or the Back of a Tortoise, from which resemblance it takes its Name. At the beginning it grows like a Chest-nut, afterward like an Egg, wherein is contained a soft Matter clothed with a certain Tunick, (whence some refer this sort of Tumour to *Meliceræ*, which see) which sticks so close to the Skull, that many times it infects and corrupts it. *Blanchard*.

TETANUS, or *Tetanon*, is a Contraction, whereby a Limb grows rigid and inflexible. The cause of it is sometimes a Relaxation or Palsy in some other Muscles, which when they are relaxed, the opposite Muscles act too strongly ; so that they draw the Part wholly to themselves, which ought to consist as it were in an *Equilibrium* betwixt both. Yet sometimes such a permanent Contraction may proceed from the Tendons being loaded and obstructed with ferous Matter, which thereupon grow rigid and stiff.

This Distemper is frequent in the Scurvy, so that the Patient can extend neither Joint nor Limb. The Tendons in the Back are sometimes contracted into a round globular Form, which by reason of such an Afflux of Humours upon them, draw the Bones out of their due places, and cause an Hunched Back, or a stooping or bending of it. It is usually distinguished into *Universal* ; of which there are three sorts, *Emprosthotonos*, *Opisthotonos*, and *Tetanos*, properly so called ; and *Particular*, which respects a certain Member, or a particular Joint. *Blanchard*.

TETRACHORD, in Musick, is a Concord or Interval of 3 Tones.

The *Tetrachord* of the Ancients, was a Rank of four Strings, accounting the *Tetrachord* for one Tone, as it is often taken in Musick.

TETRADIAPASON, a Quadruple Diapason is a Musical Chord, otherwise called a Quadruple Eighth, or Nine and Twentieth.

TETRAGONIAS, a Comet whose Head is of a Quadrangular Figure, and its Tail or Train, long, thick and uniform, and does not differ much from the Meteor called *Trabi*.

TETRAGONISM, with some foreign Writers, is the same as the Quadrature of the Circle.

TETRAGONUS. See *Quadratus Genæ*.

TETRAHEDRON. See *Regular Bodies*. N. B. these following Figures being cut in Past-board and folded up, will either of them represent the *Tetrahedron*.

TETRAPE-



TETRAPETALOUS Flower, of a Plant, is that which consists of but four single coloured Leaves (which the Botanists call *Petala*) set round the *Stylus* to compose the Flower.

Plants having a Tetrapetalous Flower, constitute a *distinct Kind*, and by Mr. Ray are divided into,

1. Such as have an uniform Tetrapetalous Flower, and their Seed-vessels a little oblongish, which therefore he calls *Siliquose*.

As the *Keiri* or *Leucoium Luteum*, and the other common *Leucoium*; the *Dentaria*, the *Leucoium Siliquosum*, *Alysson*, *Viola Lunariz*, *Paronychia*, *Hesperis*, *Alliaria*, *Rapa*, *Napus*, *Sinapis*, *Rapistrum*, *Eruca spuria*, *Erysimum*, *Cardamine*, *Turritis*, *Pilosella Siliquosa*, and the *Raphanus Rusticanus* and *Aquaticus*.

2. Such as have their Seed-case or Vessel shorter, which therefore for distinction he calls *Capsulate* and *Siliculosa*; as the *Myagrum*, *Draha*, *Leucoium Siliqua subtorunda*, *Cochlearia*, *Nasturtium*, *Lepidium vulgare*; *Thlaspi*, *Brasica marina*, *Glastrum*, *Eruca marina*, &c.

3. Such as have a kind of, or seeming Tetrapetalous Flower, i.e. a Monopetalous one divided deeply into 4 Partitions, and these he calls *Anomalous*; as the *Papaver*, *Agremone*, *Veronica*, *Tithymallus*, *Plantago*, *Coronopus*, *Psyllium*, *Lysimachia Siliquosa*, *Alfina spuria*, &c.

TETRAPHARMACUM, is a Medicine consisting of four Ingredients, as *Unguentum Basilicum*.

TETRAPOTOTES, are in Grammar, such defective Nouns, as have only four Cases; as, *Plus*, which wants the *Dative* and *Vocative* Singular.

TETRASTYLE, in Architecture, is a Building which hath four Columns in the Faces before and behind.

TEXTURE. The Texture of any Natural Body, is that peculiar disposition of its constituent Particles, and making it have such a Form, or be of such a Nature, or be endowed with such Qualities.

THALAMI Nervorum Opticorum, are two Prominences of the lateral Ventricles of the *Cerebrum*, so called, because the Optick Nerves rise out of them. They are Medullary without, but a little Cineritious within. They are of an oblong Figure.

THAUGHTS, or *Thoughts*, are the Benches on which the Rowers sit in a Boat to Row.

THELONIA rationabili habendo pro Dominis habentibus Dominica Regis ad firmam, is a Writ that lies for him that hath of the King's Demefne in Fee-farm, to recover reasonable *Toll* of the King's Tenants there, if his Demefne have been accustomed to be *Tolled*.

THELONTUM, or *Brevie essendi quieti de Thelonio*, is a Writ lying for the Citizens of any City, or Burgeses of any Town, that have a Charter or Prescription to free them from *Toll*, against the

Officers of any Town or Marker, who would constrain them to pay *Toll* of their Merchandize, contrary to the said Grant or Prescription.

THENOR, or *Tenor*, according to some, is the Name of an abducent Muscle which draws the Thumb from the Fore-finger.

THEODOLITE, is an Instrument used in Surveying, and taking of Heights and Distances.

It consisteth of several Parts: -As,

1. *A Circle of Brass*, divided into four Quadrants, representing the four Cardinal Points of the Compass, *East*, *West*, *North* and *South*, and noted with the Letters, N. S. W. E.

Each of these *Quadrants* is divided into 90 Degrees, and subdivided as the Largeness of the Instrument will permit, commonly by *Diagonals*.

These four Quadrants are to be numbered by 10, 20, 30, &c. both ways beginning at the *North* and *South* Points, and ending with 90, at the *East* and *West* Points.

2. *A Box and Needle*, so conveniently contrived to stand upon the Centre of the Circle, upon which Centre, the Instrument, the *Index*, with its *Sights*, must be made to turn about, and yet both the Instrument, and the *Box* and *Needle* remain firm. At the bottom of the *Box* there must be a *Card* or *Mariner's Compass* fixed, answerable to the Letters E. W. N. S. upon the Instrument.

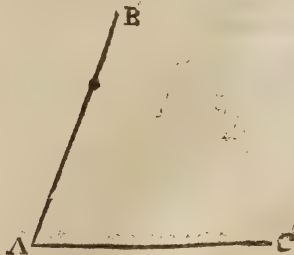
3. *A Socket* on the Back-side, (either Plain or with a *Ball*, which is much better) to be put upon the Head of a three-legged Staff.

4. *A Staff* to set the Instrument upon; the Neck at the Head whereof must be made to go into the *Socket* on the Backside of the Instrument.

Its Use is for taking *Heights* and *Distances*, as also taking of *Angles*, in Surveying of Land, &c.

To take the Quantity of an Angle by the Theodolite.

As suppose the Angle A, of a Field, two of whose Sides is A B or A C.



Place your Instrument in the Angle A, or as near as possible, and let Marks be set up near B and C, so far off the Hedges as your Instrument at A stands (which yet is not necessary) then turn the Instrument about, till through the fixed Sights you see the Mark at B, there screw it fast; next turn the moveable Index, till through the Sights thereof

you see the Mark at C, then the Degrees upon the Limb cut by the Index, gives the Angle B A C.

THEOREM, is a Speculative Proportion, demonstrating the Properties of any Subject: This is either,

1. *Universal*, which extends universally to any Quantity without Restriction; as, *That the Rectilinear angle of the Sum and Difference of any two Quantities, is equal to the Difference of their Squares.*
2. *Particular*, when it extends only to a particular Quantity.
3. *Negative*, which demonstrates the Impossibility of an Assertion; as, *That the Sum of two Biquadrate Numbers cannot make a Square.*
4. *Local*, which relates to a Surface; as, *That Triangle of the same Base and Altitude are equal.*

5. *A plain Theorem*, is that which relates to either a Rectilinear Surface, or to one terminated by the Circumference of a Circle; as, *That all Angles in the same Segment are equal.*

6. *A solid Theorem*, is that which treats about a Space terminated by a solid Line; that is, by any of the three Conick Sections; as, *If a Right Line cut two Asymptotick Parabolas, its two Parts terminated by them shall be equal.*

7. *A Reciprocal Theorem*, is one whose Converse is true; as, *That if a Triangle have two equal Sides, it must have two equal Angles.* The Converse of which is true, *That if it have two equal Angles, it must have two equal Sides.*

THERAPEUTICA, is that part of Physick, which delivers the Method of Healing.

THERIOMA, is a wild cruel Ulcer, like *Carcinoma*; which see. *Blanchard.*

THERMÆ, are the Bath or other Medicinal Waters which are Hot. 'Tis most probable, as *Dr. Woodward* well observes, (*Nat. Hist. of the Earth, p. 144.*) That these do not owe their Heat to any Colluctation or Effervescence of the Minerals in them, but to the *subterranean Heat or Fire*, which communicates with them by some *Spiracle or Canal*, by which a greater Quantity of Heat is derived thither, than to ordinary Springs. Tho' *Mr. Charas* hath lately revived the former Opinion. *Vid. Memoirs Mathemat. & de Physique, A. D. 1692.*

THERMANTICA, are healing Medicines.

THERMOSCOPE, or *Thermometer*, is a Philosophical Instrument, usually made of Glass, filled with tinged Spirit of Wine, or some other proper Liquor; and designed to measure, or estimate the Heat and cold of any particular Place; or of the same Place in different Seasons, and at different Times.

At the Bottom is a pretty large Ball filled with the Spirit or tinged Liquor, with a Stem rising, to about three or four Foot perpendicular. To adjust the Divisions, or Degrees of which; the Ball may be placed in Water, which is just beginning to freeze, and then noting the height of the Spirit in the Stem, place against that O, and graduate it afterward, up and down, for Heat and Cold.

Dr. Hook, in order to adjust these Graduations with the greater Accuracy, hath contrived, and

described an Instrument for that purpose. See *Micrograph. Pag. 38.*

The Way of filling Thermoscopes, or such other small Glass Tubes, with Spirit of Wine, or Water.

Take the Ball of the Glass, and first warm it gently between your Hands, then seal it very well (tho' gently) before a good Fire, turning it round, that it may be equally warm, for without this Caution, you'll endanger breaking it. Then applying the Ball to the Flame of a Lamp or Candle, turning it about in it, heat it as hot as you can, without melting the Glass, and then speedily immersing the open end of the Pipe into a Vessel of that Liquor you intend to fill it withal, the Liquor will rise into it, and fill it very near full.

The Reason of which ascent of the Liquor is, That the Air within the Ball and Tube, being expelled in great Measure by the Heat, or at least, rarified there to a very great Degree; the immersed open End of the Tube keeps off the Pressure of the Incumbent Atmosphere on that part of the Liquor that the end of the Tube covers; but the Atmosphere presses on all other Parts of the Liquor in the open Vessel; and consequently (there being none, or but a very small Quantity of Air within the Tube to hinder it) forces it by its weight, up into the Tube, till it gain an Equilibrium with the Pressure, or Weight of the Air without.

If by this Method the Tube cannot be filled full enough, the rest may be supplied by a small Glass-Funnel, whose Shank must be drawn out exceeding slender, and inserted into the Orifice of the Tube; and then by blowing, you may force with your Breath the Spirit of Wine into the Tube, so as to fill it quite, or to what Degree you please.

Dr. Hook, in his *Micrographia*, hath an Engine for graduating Thermometers, to make them true Standards of Heat and Cold.

THLIPSIS, is a Compression of the Vessels in an Animal Body. *Blanchard.*

THORACICA Inferior, a Branch of the Subclavian Veins, spreading it self upon the side of the Breasts by several Branches, which communicate by *Anastomosis*, with the Branches of the *Azygos*, under the Muscles of the Breast.

THORACICA Superior, is a Branch of the Subclavian Vein, arising from the *Basilica*, and goes to the *Mammilla* and Muscles of the Breast.

THORAX, or *Medius Venter*, the Chest; is all the Cavity which is circumscribed above, by the Neck-bones; below, by the *Diaphragme*; before, by the Breast-bone; behind, by the Back-bones; on the Sides, by the Ribs; it is of an Oval Figure, contains the Heart and Lungs, and is cover'd on the inside with a Membrane called *Pleura*.

Hippocrates and *Aristotle*, took all that Space from the Neck-bone, to the very Secrets, both the middle and lowermost Cavity, for the Thorax.

THOUGHTS, or *Thoughts*, so the Seamen call the Seats or Benches, on which the Men sit down to row in a Boat.

THOWLES, are those Pines in the Gunnel of a Boat, between which the Men put their Oars when they row.

THREE-LEGG'D-STAFF, is an Instrument consisting of Wooden Leggs, made with Joints to shut all together, and to take off in the middle, for the

Thunder vid U. 2.

the better Carriage ; and on its Top is usually a Ball and Socket to support and adjust Instruments for Astronomy, Surveying, &c.

THROMBUS, is a Coagulation of Blood or Milk into Clots or Clusters. *Blanchard*,

THYMUS, is a conglobate Glandule in the Throat, growing to the upper part of the *Mediastinum*, and seated between the Divisions of the Subclavian Veins and Arteries ; it is whitish, soft and spongy, and larger in Children, and in Women, than in Men. The Jugular Veins and Arteries pass thro' the Gland as they go up the Neck, but this don't send any conspicuous Twigs or Branches to it : Its Use seems to be to prop and strengthen the Divisions of the *Aorta* and *Cava*, and to defend them from being compressed by the *Clavicula* when we stoop forwards, and perhaps in Infants in whom it is large, and consists in 3 Glands, it may contribute towards the refining and depurating of the Chyle ; and possibly it may hinder (as *Verheyen* thinks) and too hasty Mixture of the Chyle with the Blood in Children.

THYROARYTENOIDES, is a Pair of large Muscles, that proceed from the Cartilage, called *Scutiformis*, and extending themselves forward to the sides of the *Arytenoides* ; the fourth and fifth Part of the *Larynx*, serve to contract, and close the opening of the *Larynx*.

THYREOIDEÆ Glandule, are two of a viscous, solid Substance, wonderfully adorned with Vessels of all sorts, and hard Membranes, almost of the bigness, and shape of an Hen's Egg, situate at the lower Part of the *Larynx*, at the sides of the Cartilages, called *Scutiformis*. Their Use seems to be to separate a Liquor from the Lubrication of the *Larynx*, whereby the Voice is rendered firm, smooth and sweet ; and they contribute also to the roundness of the Neck, by their filling up the empty Spaces about the *Larynx*.

THYROIDES, is the Cartilage, called *Scutiformis*, of the *Larynx* : Also the Hole of the *Os Pubis*, is by some called by this Name. See *Scutiformis*.

THYRSUS, is a Word used by the Botanists, for the upright, and tapering Stalk : And 'tis often used for *Spica*, which is an Ear, or Blade of Corn.

TIBIA, the Leg, is the Part betwixt the Knee and the Ankle : It consists of two Bones ; one outward, called *Focile Minus* ; another inward, and larger, which has usurped the Name of the whole, and is called *Tibia* ; others call it *Focile Majus*, and *Canna Major* : The upper End has a Process, which is received by a Cavity in the Thigh, and two oblong Cavities to admit the Heads of the Thigh-bone ; the Depth of which Cavities is encreased by a Cartilage that is annexed thereunto by Ligaments : This Cartilage is moveable, soft, slippery, moistened with an unctuous Humour ; thick in its Circumference, and smaller towards the Center, whence it is called *Lunata*, made like an Half Moon ; there are rugged sharp Ligaments before, which encrease the Lunary Cartilages : The fore Part, which is acute and long, is called *Spina* : There is below a prominent and gibbous Process in the inner Side, nigh the Foot ; and is called *Malleolus Internus*, the inner Ankle-bone.

TIBIALIS Anticus, a Muscle of the *Tarsus*, so called from its Situation on the Fore-part of the *Tibia* : It's also by *Spigelius* called, *Musculus Cate-næ*, because when it is divided, the Patient is

forced to use a Sling, to support the Foot in walking : Its Origination is fleshy from the lower Part of the superior Appendage of the *Tibia*, between the Prominence, where the great Tendon of all the extending Muscles of the Leg is inserted, and the Origination of the *Musculus Extensor magnus Digtorum Pedis* : It also continues a disengaged fleshy Origination, for near two Thirds of the superior Part of the said *Tibia*, externally Laternal, next the *Fibula* ; which composing a fleshy Belly, lessens it self in half its Progress, and growing into a strong, and somewhat round Tendon, descending obliquely over the inferior Part of the said *Tibia* ; and under the Annular Ligament, is inserted to the inside of the *Os Cuneiforme Majus*, that sustains the *Os Metatarsus Pollicis* : This pulls the Foot upwards and forwards, directly.

TIBIALIS Posticus, is a Muscle of the Foot, which being placed on the Back-part of the *Tibia* ; is also called *Musculus Nauticus*, because Mariners chiefly use it in climbing up the Masts of their Ships. It lies partly under the *Flexor tertii internodii Pollicis*, which Muscle must be partly raised together with the *Flexor tertii internodii Digtorum Pedis*, before we can have a clear sight of it. It appears Biventral, arising partly Tendinous, and partly fleshy from the Superior and Back-part of the *Fibula* ; as also from the Ligament that is contained between the said Bone and the *Tibia* ; in near half its Progress it becomes less, and grows fleshy again, and making a strong round Tendon which runs in a *Sinus*, on the Back-part of the lower Appendage of the *Tibia*, called the *Malleolus Internus* under an Annular Ligament, and is inserted to the *Os Naviculare*, internally and laterally. This draws the Foot upwards and inwards.

TIDE, the Word *Tide* signifies as well the Ebbing as the Flowing of the Sea ; the former of which the Seamen call *Tide of Ebb* ; the latter, *Tide of Flood*. A *Windward Tide*, is when the Tide runs against the Wind. A *Leeward Tide*, is when the Wind and Tide go both the same way ; when the Tide runs very strong, they call it a *Tide-Gate*. *To tide it over*, or *up* into any Place, is to go in with the Tide of Flood or Ebb, as long as that lasts, and then to stay at an Anchor all the Time the contrary Tide lasts, and then to set in again, when the same Tide returns. It's said to flow *Tide* and *Half-tide*, when the Tide runs three Hours (which is four Points of the Compass) in the *Offing*, longer than it doth by the Shore. By longer, they do not mean more Hours, for it always Ebbs and Flows six Hours, but that if it be high Water a Shoar at Twelve a Clock, it will not be so in the *Offing* till Three, which is the Bound, and Time for the running of a Half-tide. If it Ebbs and Flows more, they say, It runs Half-tide, and half Quarter, that is five Points ; when they are to go into a Harbour over a Bar or Sand, their Word is, that they will bring the Tide with them ; that is, they will come in with the Flood, that so they may get over the Bar or Sand safely.

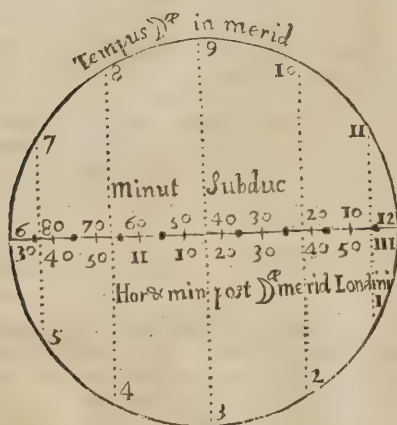
TIDES. Mr. *Henry Philips* in *Philosoph. Trans.* N. 34. gives the following Proportion for finding the Tides.

First, Divide a Circle into 12 equal Parts, or Hours, according to the Moon's Motion, or Distance from the Sun, from the New Moon to the Full.

Secondly, Let the Diameter of the Circle be divided into 90 Parts or Minutes, that is according to the Time of the Difference of Tides between the New, or Full Moon, and the Quarters, which is one Hour and a half.

Thirdly, Make Perpendicular Lines cross the Diameter of the Circle, from Hour to Hour.

Fourthly, Reckon the Time of the Moon's coming to the South in the Circumference of the Circle, and observe the Perpendicular Line that falls from that Point upon the Diameter; and the Proportional Minutes cut thereby, will shew how many Hours or Minutes are to be subtracted from the Time of high Tides at the New and Full Moon, that so you may have the true Time of the Tides that present Day.



Example.

At London, on the Day of the New and Full Moon, it is High-tide at 3 of the Clock; that is, when the Moon is 3 Hours past the Meridian: And so by the common Rule, the Moon being about 4 Days old, it will be South about 3 of the Clock, and it will be High-tide 3 Hours afterwards; that is, at 6 of the Clock. But now by this Rule, if you count this Time of the Moon's coming to the South, in the Circumference, the Perpendicular Line which comes from 3 to 9, cuts the Diameter in the half at 45 Minutes: Which shews, that so much is to be abated from the Time of High-water in the New and Full Moon: So that it is High-tide 45 Minutes before 6 of the Clock; that is, at 5 Hours, 15 Minutes, and not at 6 of the Clock, according to the common Rules.

The like you may do for any other Port or Place, knowing the Time of High-water, at the New and Full Moon in that Place: And this may be more readily done, if you set down the Time of High-water at the New and Full Moon under the Diameter, as is done for London in this Example, where 'tis High-tide at 3 of the Clock. So that when the Moon is South at 3 of the Clock, the Perpendicular cuts the Diameter at 2 Hours, 15 Minutes; which added to the Time of the Southing, gives 5 Hours, 15 Minutes; and so when the Moon is South at 9 of the Clock, by adding 2 Hours, 15 Minutes, you have the Time of High-water, which is 11 Hours, 15 Minutes.

And thus you may easily make a Table, which by the Southing of the Moon, shall readily tell you the Time of High-tide at any Time of the Moon.

Note, If the Difference be not so much between the Neap-tides and Spring-tides, in other Places as it is in this our Example, the Diameter must be divided into fewer Parts.

Our learned Astronomer Mr. Flamsteed, *Philos. Trans.* N. 143. gives us a new and more correct Tide-Table, (which he also now publishes every Year) improving what Mr. Philips had begun, by observing that the Tides did not usually hold out so long as Mr. Philips's Calculation made them to do. He found by above 80 Observations of the High-waters at Tower-wharf and Greenwich, That the greatest Differences between the Moon's true Southing, and the High-waters, were not, as Philips said, at Full, New, and Quarter Moons, but the greatest near the Neaps, and the less near the highest Spring-tides.

There is an Hypothesis to solve the Motion of the Tides, mentioned in *Philosoph. Trans.* N. 16. from that Learned Mathematician Dr. Wallis: In which, he supposes the Earth and Moon to move round the Sun, in a Circle, or Ellipse, described by their common Centre of Gravity. But this Hypothesis places the highest Annual Tides not near the Equinoxes, but about Candlemas and All-hollantide; that is, in the beginning of February and November. But I could never find that the Thing was so in Fact; but that on the contrary, they are always greatest at or near the Equinoxes, as hath been generally observed: I shall therefore refer the Reader to the Ingenious Hypothesis itself, without giving any particular Account of it here.

The true Theory of the Tides extracted from that admirable Treatise of Sir Isaac Newton, Intituled, *Philosophiæ Naturalis Principia Mathematica*; By that Excellent Mathematician, Captain Halley.

The Principle upon which this Author proceeds to explain most of the great and surprising Appearances of Nature; is no other than that of Gravity, whereby in the Earth all Bodies have a Tendency towards its Centre, as is most evident: And from undoubted Arguments 'tis proved, That there is such a Gravitation towards the Centre of the Sun, Moon, and all the Planets.

From this Principle, as a necessary Consequence, follows the Spherical Figure of the Earth and Sea, and of all the other Celestial Bodies; and tho' the tenacity and firmness of the solid Parts, support the Inequalities of the Land above the Level; yet the Fluids pressing equally, and easily yielding to each other, do soon restore the Equilibrium, if disturbed, and maintain the exact Figure of the Globe.

Now this Force of the Descent of Bodies towards the Centre, is not in all Places alike, but is still less and less, as the Distance from the Centre encreases: And in the said Book it is demonstrated, That this Force decreases as the Square of the Distance encreases; that is, the Weight of Bodies, and the Force of their Fall is less, in Parts more removed from the Centre, in the Proportion of the Squares of the Distance.

As

As for Example.

A Ton Weight on the Surface of the Earth, if it were rais'd to the height of 4000 Miles, which let be the Semidiameter of the Earth, would weigh but a Quarter of a Ton, or 500 l. Weight.

If to 12000 Miles, or 3 Semi-diameters from the Surface; that is, 4 from the Centre, it would weigh but 1 sixteenth Part of the Weight on the Surface, or a Hundred and a Quarter: So that it would be as easie for the Strength of a Man at that height, to carry a Ton Weight, as here on the Surface to carry a Hundred and a Quarter.

And in the same Proportion does the Velocities of the Fall of Bodies decrease: For whereas on the Surface of the Earth, all things fall 16 Foot in a Second, at one Semi-diameter above; this Fall is but 4 Foot; and at 3 Semi-diameters, or 4 from the Centre, it is but $\frac{1}{16}$ of the Fall at the Surface, or but one Foot in a Second, and at greater Distances both Weight and Fall become very little; but yet at all given Distances, is still something, tho' the Effect become insensible.

At the Distance of the Moon (which suppose to be 60 Semi-diameters of the Earth) 3600 Pounds Weight but one Pound, and the Fall of Bodies is but $\frac{1}{1600}$ of a Foot in a Second, or 16 Foot in a Minute; that is, that a Body so far off descends in a Minute no more than the same at the Surface of the Earth would do in a Second of Time.

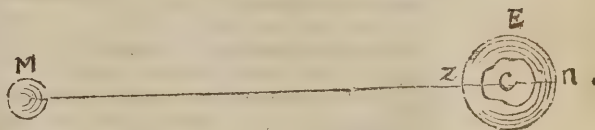
And as was said before, the same force decreasing after the same manner, is evidently found in the Sun, Moon, and all the Planets; but more especially in the Sun, whose Force is prodigious becoming sensible even at the immense distance of Saturn. This gives room to suspect that the force of Gravity is in the Celestial Globes proportional to the Quantity of Matter in each of them: And the Sun being at least 10000 times (for Instance, tho' he is far bigger) as big as the Earth, its Gravitation or attracting force, is found to be at least 10000 times as much as that of the Earth, acting on Bodies at the same Distances.

Whence also, all the surprizing Phenomina of the Flux and Reflux of the Sea he shews in the like manner to proceed from the same Principle.

If the Earth were alone, that is to say, not affected by the Actions of the Sun and Moon, it is not to be doubted, but the Ocean being equally prest by the force of Gravity towards the Centre, would continue in a perfect Stagnation always at the same height, without ever ebbing or flowing; but it being by him demonstrated, That the Sun and Moon have a like Principle of Gravitation towards their Centers, and that the Earth is within the Activity of their Attractions, it will plainly follow, That the Equality of the Pressure of Gravity towards the Centre will thereby be disturbed; and tho' the smallness of these Forces, in respect to the Gravitation towards the Earth's Centre, render them altogether imperceptible by any Experiments we can devise, yet the Ocean being fluid, and yielding to the least force, by its rising, shews where it is least prest, and where it is more prest by its sinking.

Now if we suppose the force of the Moon's Attraction to decrease as the Square of the Distance from its Center increases, (as in the Earth, and other Celestial Bodies) we shall find, that where the Moon is perpendicularly either above or below the

Horizon, either in Zenith or Nadir, there the force of Gravity is most of all diminished, and consequently that there the Ocean must necessarily swell, by the coming in of the Water from those Parts where the Pressure is greatest, viz. in those Places where the Moon is near the Horizon; but that this may be the better understood, I was thought needful to add the following Scheme, where M is the Moon, E the Earth, C its Centre, Z the Place where the Moon is in the Zenith, N where the Nadir.



Now by the Hypothesis it is evident, that the Water in Z, being nearer, is more drawn by the Moon, than the Centre of the Earth C, and that again more than the Water in N; therefore the Water in Z has a Tendency towards the Moon, contrary to that of Gravity, being equal to the Excess of the Gravitation in Z, above that in C. And in the other Case, the Water in N tending less towards the Moon, than the Centre C, will be less prest'd, by as much as is the Difference of the Gravitations towards the Moon in C and in N.

This rightly understood, it follows plainly, that the Sea, which otherwise should be Spherical, upon the Pressure of the Moon, must form it self into a Spheroidal, or Oval Figure, whose longest Diameter is where the Moon is Vertical, and shortest where she is in the Horizon; and that the Moon shifting her Position, as she turns round the Earth once a Day, this Oval of Water shifts with her, occasioning thereby the two Floods and Ebbs observable in each 25 Hours.

And this may suffice as to the general Cause of the Tides: It remains now to shew how naturally this Motion accounts for all the Particulars that have been observed about them; so that there can be no room left to doubt, but that this is the true Cause thereof.

The Spring-tides, upon the New and Full Moon; and the Neap-tides, on the Quarters, are occasion'd by the attractive Force of the Sun, in the New and Full, conspiring with the Attraction of the Moon, and producing a Tide by their united Forces; whereas in the Quarters, the Sun raises the Water where the Moon depresses it, and on the contrary; so as the Tides are made only by the Difference of their Attraction.

That the force of the Sun is no greater in this Case, proceeds from the very small Proportion the Semi-diameter of the Earth bears to the vast Distance of the Sun.

It is also observed, That *ceteris paribus*, the Equinoctial Spring-tides in March and September, or near them, are the highest, and the Neap-tides the lowest; which proceeds from the greater Agitation of the Waters, when the fluid Spheroid revolves about a great Circle of the Earth, than when it turns about in a lesser Circle; it being plain, that if the Moon were constituted in the Pole, and there stood, that the Spheroid would have a fixt Position, and that it would be always High-water under the Poles, and Low-water every where under the Equinoctial; and therefore the nearer the Moon approaches the Poles, the less is the Agitation of the Ocean;

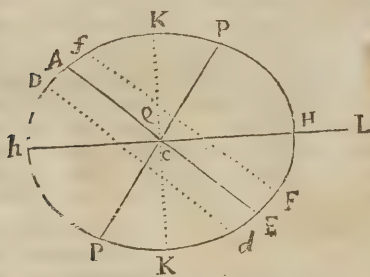
Ocean, which is of all the greatest, when the Moon is in the Equinoctial, or farthest distant from the Poles.

Whence the Sun and Moon, being either conjoin'd or opposite in the Equinoctial, produce the greatest *Spring-tides*; and the subsequent *Neap-tides* being produced by the Tropical Moon in the Quarters, are always the least *Tides*; whereas in June and December the *Spring-tides* are made by the Tropical Sun and Moon, and therefore less vigorous; and the *Neap-tides* by the Equinoctial Moon, and therefore are the stronger.

Hence it happens, that the Difference between the *Spring* and *Neap-tides* in these Months, is much less considerable than in March and September.

And the Reason why the highest *Spring-tides* are found to be rather before the *Vernal*, and after the *Autumnal Equinox*, viz. in February and October, than precisely upon them, is, because the Sun is nearer the Earth in the Winter Months, and so comes to have a greater Effect in producing the *Tides*.

Hitherto we have considered such Affections of the *Tides* as are universal, without Relation to particular Cafes; what follows from the differing Latitudes of Places, will be easily understood by the following Figures.



Let A P P E P be the Earth covered over with very deep Waters, C its Centre, P P its Poles, A E the Equinoctial, F f the Parallel of Latitude of a Place, D d another Parallel at equal Distance on the other side of the Equinoctial, H h the two Points where the Moon is Vertical, and let K K be the great Circle wherein the Moon appears Horizontal.

It is evident, that a Spheroid described upon H h and K K, shall nearly represent the Figure of the Sea; and C f, C D, C F, C d, shall be the Heights of the Sea in the Places f, D, F, d, in all which it is *High-water*: And seeing that in 12 Hours time, by the diurnal Rotation of the Earth, the Point F is transfer'd to f and d to D: The Height of the Sea C F, will be that of the *High-water*, when the Moon is present, and C f that of the other *High-water*, when the Moon is under the Earth; which in the Cafe of this Figure is less than the former C F.

And in the opposite Parallel D d, the contrary happens: The rising of the Water being always alternately greater and less in each place, when it is produced by the Moon declining sensibly from the Equinoctial, that being the greatest of the two *High-waters* in each Diurnal Revolution of the Moon, wherein the approaches nearest either to the Zenith or Nadir of the Place. Whence it is, that

the Moon in the Northern Signs in this part of the World, makes the greatest *Tides* when above the Earth, and in the Southern Signs when under the Earth; the Effect being always the greatest where the Moon is farthest from the Horizon, either above or below it.

And this alternate Increase and Decrease of the *Tides*, has been observ'd to hold true on the Coast of England, at Bristol by Captain Stummy, and at Plymouth by Mr. Colepreffe.

But the Motions hitherto mention'd, are somewhat altered by the Libration of the Water, whereby tho' the Action of the Luminaries should cease, the Flux and Reflux of the Sea would for some time continue: This Conservation of the impressed Motion diminishes the Difference that otherwise would be between two consequent *Tides*, and is the Reason why the highest *Spring-tides* are not precisely on the New and Full Moons, nor the *Neaps* on the Quarters; but generally they are the third *Tides* after them, and sometimes later.

All these things would regularly come to pass, if the whole Earth were covered with Sea very deep; but by reason of the shoalness of some places, and the narrowness of the Straits, by which the *Tides* are in many Places propagated, there arises a great diversity in the Effect, and not to be accounted for, without an exact Knowledge of all the Circumstances of the Places; as of the Position of the Land, and the Breadth and Depth of the Channels by which the *Tide* flows; for a very slow and imperceptible Motion of the whole Body of the Water, where it is (for Example) two Miles deep, will suffice to raise its Surface 10 or 12 Feet in a *Tide's* Time; whereas, if the same Quantity of Water were to be conveyed upon a Channel of 40 Fathom deep, it would require a very great Stream to effect it, in so large Inlets as are the Channel of England, and the German Ocean; whence the *Tide* is found to set strongest in those Places where the Sea grows narrowest, the same Quantity of Water being to pass through a smaller Passage: This is most evident in the *Streights* between Portland and C. de Hoguë in Normandy, where the *Tide* runs like a Sluce, and would be yet more between Dover and Calais, if the *Tide* coming about the Island from the North did not check it. And this Force being once impress'd upon the Water, continues to carry it about the Level of the ordinary height in the Ocean, particularly where the Water meets a direct Obstacle, as it is in St. Maloes; and where it enters into a long Channel, which running far into the Land, grows very strait as its Extremity; as it is in the Severn-Sea, at Chepstow and Bristol.

This shoalness of the Sea, and the Intercurrent Continents, are the Reason that in the open Ocean the Time of *High-water* is not at the Moon's Appulse to the Meridian, but always some Hours after it, as it is observed upon all the West Coast of Europe and Africa; from Ireland to the Cape of Good Hope: In all which, a South-West Moon makes *High-water*; and the same is reported to be on the West of America.

But it would be endless to account all the Particular Solutions, which are easie Corollaries from this Hypothesis; as, why the Lakes, such as the Caspian-Sea, and Mediterranean-Sea; such as the Black-Sea, the *Streights*, and Baltick, have no sensible *Tides*: For Lakes, having no Communication with the Ocean, can neither increase or diminish

minish their Water, whereby to rise, and fall; and Seas that communicate by such narrow Inlets, and are of so immense an extent, cannot in a few Hours time receive, or empty Water enough to raise, or sink their Surface in any thing sensibly.

Lastly, to demonstrate the Excellency of this Doctrine, the Example of the Tides in the Port of *Tunking* in *China*, which are so extraordinary, and differing, from all others we have yet heard of, may suffice. In this Port there is but one Flood, and Ebb in 24 Hours; and twice in each Month, viz. when the *Moon* is near the Equinoctial, there is no Tide at all, but the Water is Stagnant; but with the *Moon's* Declination there begins a Tide, which is greatest when she is in the Tropical Signs; only with this difference, that when the *Moon* is to the North-ward of the Equinoctial, it Flows when she is above the Earth, and Ebbs when she is under, so as to make *High-Water* at *Moon* setting, and *Low-water* at *Moon's* rising: But on the contrary, the *Moon* being to the Southward, makes *High-water* at rising, and *Low-water* at setting, it Ebbs all the time she is above the Horizon. As may be seen more at large, in the *Philosoph. Transact.* N. 162.

The Cause of this odd Appearance, is proposed by Sir *Isaac Newton*, to be from the concurrence of two Tides, the one propagated in 6 Hours, out of the great *South Sea*, along the Coast of *China*; the other out of the *Indian Sea*, from between the Islands, in 12 Hours, along the Coast of *Malacca*, and *Cambodia*.

The one of these Tides, being produced in North-Latitude, is, as has been said, greater when the *Moon* being to the North of the Equator, is above the Earth, and less when she is under the Earth.

The other of them, which is propagated from the *Indian Sea*, being raised in South Latitude, is greater when the *Moon* declining to the South is above the Earth, ~~and~~ less when she is under the Earth; so that of these Tides, alternately greater and lesser, there comes always successively two of the greater, and two of the lesser together every Day; and the *High-water* falls always between the times of the arrival of the two greater Floods; and the *Low-water* between the arrival of the two lesser Floods. And the *Moon* coming to the Equinoctial, and the alternate Floods becoming equal, the Tide ceases, and the Water stagnates; But when she has passed to the other side of the Equator, those Floods which in the former order were the least, now becoming the greatest, that which before was the time of the *High-water*, now becomes the *Low-water*, and the Converse; so that the whole appearance of these strange Tides, is without any forcing naturally deduced from these Principles, and is a great Argument of the certainty of the whole Theory.

The Theory of *Des Cartes*, whereby he endeavours to explain the Phenomena of Tides, supposes the *Moon* to move round the Earth in an Ellipsis, in whose Centre the Earth is placed, so that by this means the *Moon* will have two *Apogaeums*, and two *Perigaeums*; and according to him the must always be in one of her *Prigaeums*, at the time of her Opposition, or Conjunction; so that then he supposes her to press more strongly upon the Sea, than she doth at her Quadratures, when he saith she is in her *Apogaeum*, and consequently hath a weaker Pressure: But now besides that, if this were so

it would not solve the thing, the Fact it self is notoriously False; for the *Moon* is as often in her *Apogaeum* at New, and Full, as she is in her *Perigaeum* at those times; tho' it seldom happens, that she is exactly in either, at her Lunations; Vid. Mr. *Keil's* Examination of *Burnet's Theory*, Introduct. P. 17.

Dr. *Gregory* in his *Astronomy*, Book 4. Prop. 65 P. 384. demonstrates also, That if the Globe of the Earth, were every where covered over with a deep Sea (not now considering the Figure, which would arise from its Revolution, round its Axis) it would put on the Figure of an oblong Spheroid, whose Axis produced, would pass through the *Moon*; and this by Reason of the Gravitation of the Parts of the Water towards the *Moon*: And for the same Reason, the Earth would put on an oblong Spheroidal Figure, whose produced Axis, would also pass thro' the Sun.

And then in the next Proposition he proves, That the Flux, and Reflux of the Sea, is occasioned by the Water covering our Globe, its putting on two oblong Spheroidal Figures, whose Axes produced, would pass thro' the *Moon* and Sun.

And this true Cause of the Tides, he saith, was first discovered by the great *Kepler*, and afterwards improved very much, by our Incomparable Sir *Isaac Newton*; which shewed that the Sea must needs rise both under the *Moon*, and in the Part Diametrically opposite to that.

And this Spheroidal Figure of the Water of the Sea, which like two Mountains is stretcht out, one towards the *Moon*, and the other to the Part opposite to her, is continually moving, or shifting according to the daily Motion of the *Moon*, which it follows; (or rather indeed, the Earth moving towards the East in its daily Motion, shifts it self away from these Mountains of Water, which keep as it were immovable under and opposite to the *Moon*, as the more slowly moves towards the East) hence I say it must needs be, that the Water must twice rise and fall in 25 Hours; in which time the *Moon* moves from the Meridian of any Place, to the same again.

And because the Water of the Earth will swell, or be raised in those Places to whom the Sun is in the Zenith, or Nadir; (as he proves, Prop. 64.) altho' much less than when the *Moon* is so posited: Therefore in the Conjunction, and Opposition of these Luminaries, the aforesaid Protuberance of the Water will be conjoined; and consequently then the highest Spring-Tides; and the lowest Ebbs will be when both those Luminaries are in the Horizon of any Place; because the Water is then elevated, and now depressed by the conjoint Force of both.

But in the Quadratures of the Luminaries, the Sun elevates the Water where the *Moon* makes it fall, and makes it fall where the *Moon* elevates it; so that the Elevation of the Water depending only on the difference of these Forces, will be the least of all, and so for the Depression. Between the Syzygies, and the Quadratures, the Effects of the Luminaries on the Water, will be at a mean between the two former.

When the *Moon* is in the Equinoctial, the two opposite Protuberances, or Eminences of the Water, will be also in the Earths Equator, and each of them describing that greatest Circle of the Earth, by its Diurnal Revolution, it will move swifter, and when it is thrown towards the Shoars, will

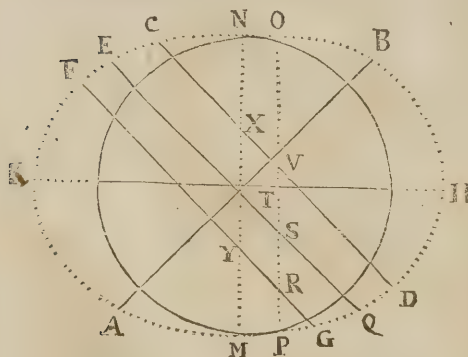
rise higher there; besides that, something must also be allowed for the Equatorial Diameter of the Earth, being its longest, and consequently the Water there being something nearer to the Luminary, will be raised higher, by their Influence, than in other Parts.

And therefore whenever the Luminaries are either in Conjunction, or Opposition, in the Equator, their Forces will be conjoined to raise or elevate the Sea at the Equator; as happens at the Syzygies next the Equinoxes, or in or near March and September, when we have always the greatest Annual Tides; as the Tides at the Quadratures of those Moons, are always the least, or most Neap.

Again, the Tides, (other things considered) are always greatest when the Luminaries are in Perigæo, and least when they are in Apogæo; and since this is the Case of the Moon in every Lunation, but of the Sun only in the Winter, this joined to the former, occasions that the greatest Tides in the Syzygies, and the least in the next Quadratures, do precede the Vernal Equinox, and follow the Autumnal one.

Hitherto the Properties of the Tides have been considered only universally, as they affect the whole Globe of the Earth; it remains, that those should be next spoken of, which arise from the different Latitudes of different Places.

To which purpose, let BEKAQH represent the Earth, whose Centre is at T, its North Pole A, the other B: EQ the Equator, and CD, FG, two Parallels to it, one toward the North, the other toward the South.



Let the Water round the Earth conform it self into an Oblong Spheroid, (because of the Moon's being near it) whose Axis KH, produced towards H, shall pass through the Moon: Then shall TH, or TK, be the greatest height of the Water, (reckoning from the Centre T) and TM, or TN, the least; which latter is equal to the height of the Water in any Point of the Circle NM: *v. gr.* where ever it meets with the Parallels, CD, FG, as suppose in X or Y.

Also the Right Lines TC, TF, TD, and TG, (being supposed to be drawn) will denote the height of the Water in the several Points C, F, D, and G: Then drawing the Circle PO, parallel to NM, the supposed Right Lines, TO, TV, TS, TR, and TP, will be the heights of the Water in the Points O, V, S, R and P, where the said Circle meets with the Equator and its Parallels.

This being supposed, Let us consider any Place on the Earth, by its Diurnal Rotation, to describe the Parallel CD: It is then plain, that when the Place is at D; TD will then be the greatest height of that Water, when the Moon is in the Meridian of the Place; but the Water will be at lowest, when that Place hath moved to X; and then highest again when it is come to C, as hath been before shewn.

But now because TD is longer than TC, (as being nearer to the longest of all TH) in the present Case, when the Moon declines towards the elevated Pole, the height of the Water will be greater when the Moon is in the Meridian, above the Horizon, than when in the same Circle below it.

In like manner TG, will be less than TF, (as being nearer the shortest of all TM) that is in the Place, describing the Path, or Circle FG, by the Earth's Diurnal Motion. TG, will be the greatest height of the Water, happening while the Moon declines toward the depressed Pole A, and is on the Meridian above the Horizon; but this is less than its greatest Altitude which happens when the Moon comes to the other half of the Meridian.

Moreover, the Difference of this Tide, now greater, now lesser (in Places situate without the Equator, according as the Moon moves towards the visible, or latent part of the Meridian) will be greater, if it be conjoined with the Causes abovementioned, and which will produce a like Effect, *V. gr.* at the Solstices; for then in the Syzygies, both the Luminaries do most of all decline from the Equinoctial; and such a Declination, (it hath been shewed) occasions the Alteration of the Tides.

And this effect will yet be increased when the ascending Node of the Moon's Orbit, passes the Vernal Equinox; for then the Moon conjoined to the Sun, declines towards the North, or South, by the Quantity of her greatest Latitude, above the Declination which is equal to the Sun's greatest Declination.

All which things are in this State if the Earth be supposed to be quite covered over with Water, to a great Depth; but because of the Land, Islands, Straits, &c. there will be an infinite Variety in the Phenomena of the Tides; yet there is no doubt, but if that the Situation of Places, &c. be well considered, and Observations of the Tides there exactly made, all things will be found to agree very well with this Theory, and to be easily accountable from it.

TIERCE, or a *Third*, is a Term in *Musick*, signifying a certain Division of the *Monochord*, in which if the Terms be as 5 to 4, 'tis called, a *Tierce Major*, or a *Diton*; but if the Terms are as 6 to 5, then 'tis called a *Tierce Minor*, or *Demi-Diton*.

TIES aboard a Ship, are those Ropes by which the Yards do hang: And when the Halliards are strained to hoist the Yards, these *Ties* carry them up.

TILLER, the very same with the Helm of a Ship: It is most properly used in a Boat where that which would be the Helm in a Ship, is called the *Tiller*.

TIMBRE, (or rather *Timmer*, saith *Guillum*) is the Herald's term for the Crest which in any Achievement stands a top of the Helmet.

TIME, in *Musick*, is that quantity, or length whereby is assign'd to every particular *Note*, its due Measure, without making it either longer or shorter than it ought to be; and it is twofold, viz. *Duple* or *Common*, and *Triple*.

Duple, or *Semi-breve time*, generally called *Common*, because most used, is when all the *Notes* are encreased by two: As 2 *Longs* make a *Large*, 2 *Breves* a *Long*, 2 *Semi-breves* a *Breve*, 2 *Minims* a *Semi-breve*, 2 *Crotchets* a *Minim*, 2 *Quavers* a *Crotchet*, 2 *Semi-quavers* a *Quaver*, and 2 *Demi-Semi-quavers* a *Semi-quaver*.

This sort of *Time* is usual in *Anthems*, *Almains*, *Pavans*, *Fantasies*, &c.

Triple Time, is that wherein the Measure is counted by *Threes*: As one *Semi-breve* is equivalent to 3 *Minims*, one *Minim* to 3 *Crotchets*, &c. So that this swifter *Time* or Measure is proper for *Airy Songs*, and *Light Lessons*: As *Courants*, *Sarabands*, *Figgs*, &c.

To these sorts of *Time* may be added, *Sesquialteran Proportion*, which signifies a *Triple Measure* of three *Notes*, to two such like *Notes* of the *Common Time*.

TIME, is a certain Measure depending on the Motion of the *Luminaries*, by which the Distance and Duration of things is measured; and is either *Astronomical*, which is simply taken from the Motion of the Stars: Or *Civil*, which is *Astronomical Time* accommodated to *Vulgar Uses*.

Astronomical, *Mathematical*, or *Absolute Time*, flows equably in its self without Relation to any thing External; and by another Word is called *Duration*.

But *Relative*, *Apparent*, or *Vulgar Time*, is the sensible, and external Measure of any Duration estimated by Motion, and this the *vulgar Uses*, instead of true *Time*.

TIN-GLASS. See *Bismuth*.

TINEA, when a sort of running Sores in the Head, full of little Holes (called *Achores*) continue long, or be too slowly or ill cured, they grow into *Tinea's*, i. e. crusty stinking Ulcers of the Head, which gnaw, and consume its Skin; therefore 'tis deservedly reckoned amongst the Diseases of Children, but when they are a little grown; for tho' adult Persons are sometimes troubled with this Disease, yet they contract the rudiments, and Seeds of it in their Infancy. It is called *Tinea*, which signifies a Moth, from those little Worms which eat, and consume Cloths; because those Ulcers prey upon the Skin of the Head, as those Animals upon Cloths. What the *Greeks* called this Distemper, is not so obvious. *Blanchard*.

TINCTURE, the *Heralds* call the Colours in an Escutcheon, or Coat of Arms, *Tinctures*.

TINCTURE, in Chymistry, is a Dissolution of the more fine, and volatile Parts of a mixt Body in Spirit of Wine, or some such proper Menstruum. The Matter is bruited in a Mortar, and then put into a Matras, and on it the Spirit of Wine (usually) is poured to the height of two, or three Fingers above it: Then the Glass is close stopp'd and set in Digestion in a Sand Heat for four or five Days, till the Spirit is well impregnated, and hath received an high Colour, or Tincture from the Matter. Thus the Tincture of Cinnamon, and all Odoriferous Vegetables are drawn.

And when Tinctures are drawn from Minerals, or Metals; this Spirit is the common Menstruum made use of.

TINNITUS Aurium, is a certain buzzing, or tingling in the Ears, proceeding from Obstruction, or something that irritates the Ear, whereby the Air that is shut up, is continually moved by the beating of the Arteries; and the Drum of the Ear is lightly verberated; whence arises a buzzing, or noise.

TIRE, or as the Seamen pronounce it *Teer* of Guns, are a Rank of them placed along a Ship's side, either above, upon Deck, or below: The former of which, are called the *upper Tire of Guns*; the latter, the *lower Tire*. There is also in some Ships half a *Tire* on the *Fore-deck*, and *Half decks*.

TITE, the Seamen say a Ship is *Tight* or *Tite*, when she is so staunch as to let in but very little Water; and this is known by the smell of the Water Pump out, for if she let in but little Water, it will always stink, otherwise not.

TITILLATION, is that Sensation we have in any Part of the Body when tickled.

TITLE of Entry, is when one is seized of Land in *Fee*, makes a Feoffment thereof on Condition, and the Condition is broken; after which the Feoffor hath *Title* to enter into the Land, and may do so at his Pleasure, and by his *Entry* the Freehold shall be said to be in him presently: And 'tis called *Title of Entry*, because he cannot have a Writ of Right against his Feoffee upon Condition, for his Right was out of him by the Feoffment, which cannot be reduced with *Entry*, and the *Entry* must be for the Breach of the Condition.

TIMESIS, is a Figure in the Grammar, whereby a compound Word hath its Parts separated from one another, by the Interposition of some other Word, as in this of *Terrence*.

Quæ meo cunque animo lubitum est facere.

Where *Quæ* and *cunque*, are divided by putting *meo* between them.

TOISON d'Or, (French) the Term in Heraldry for a golden Fleece, which is sometimes born in a Coat of Arms.

TOLL, or *Tboll*, in common Law, hath two Significations. First, It is used for a Liberty, to buy, and sell within the Precincts of a Mannor. Secondly, For a Tribute, or Custom paid for passage, &c. Some Interpret it to be a Liberty, as well to take, as to be free from *Toll*; for they who are Enfeoffed with *Toll* are Custom-free.

TOLT, is a Writ, whereby a Cause depending in a Court-Baron, is removed to the County-court; and is so called, because it does *Tollere loquelam*, from the one Court, to another.

TOMENTUM, properly signifies *Flocks*, or *Locks* of Wool; but by Botanists 'tis used for that soft Downy Matter which grows on the Tops of some Plants; which therefore are denominated from hence; as *Græmen Tomentosum*, *Carduus Tomentosus*, &c.

TOMETICA, the same with *Attenuantria*.

TOMOTOCIA, the same with *Hysterosomia*. *Blanchard*.

TONDINO, a Term in Architecture. See *Astragal*.

TONE, a Term in Musick, signifying a certain Degree of Elevation, or Depression of the Voice, or some other Sound. *Musicians* commonly determine it to be the sixth Part of an *Octave*, in which Sense, the *Octave* is said to be composed of Five *Tonets*, and two *Semi-tones*; and the *Tone* to be the

Difference between the fourth and fifth. A *Tone*, or whole Note is divided into nine Particles call'd *Comma's*, five of which are assigned to the greater *Semi-tone*, and four to the lesser.

TONICA, are those things which being externally applied to, and rubb'd into the Limbs; strengthen the Nerves, and Tendon. *Blanchard*.

TONNAGE, is a Custom or Impost paid to the King, for Merchandise carried out, or brought in Ships, and such like Vessels, according to a certain Rate upon every Tun.

TONSILLÆ, the Almonds of the Ears, as they are vulgarly call'd, are two Glands seated at the Root of the Tongue, on each side of the *Uvula*, and at the Top of the *Larynx*, covered with the common Membrane that invests all the Mouth.

Dr. *Wharton* says, That tho' they seem two, yet they are really but one, being continued to one another by a thin and broad Production, which is of the same glandulous substance with themselves. He says, They are of a yellowish Colour, and compares their Substance to concreted Honey, only they are of a more firm Consistency, but they look sandy like it: They have small Vessels from the *Jugular Veins* and *Arteries*, and *Nerves* from the fifth Pair.

They have each a large oval common Duct, or *Sinus* that opens into the Mouth so wide in an Ox, that one may put the tip of the little Finger into it. Into this many lesser open, and by a discharge into the Mouth, &c. the Liquor that is separated in the Gland.

Fallopian hath observ'd this Aperture or *Sinus*, to look like a small Ulcer when the Gland has been swelled, and sometimes by unskilful Persons, to have been treated as such, when it has only been forced to gap a little too much through the too plentiful Defluxion of Humours upon the Gland.

The Use of these Glands was by the Ancients supposed to be only to separate a certain mucous, or pituitous Matter from the Blood, for the moistening, and lubricating of the *Larynx*, Tongue, Fauces, and Gullet: But Dr. *Wharton*, and as many as attribute a fermentative Quality to the *Saliva*, ascribe a more noble Use to them; viz. to make a Ferment to further the Concoction of the Stomach: Yea, Dr. *Wharton* (but I think mistakingly) thinks that they are the chief Instrument of Taste.

TOP (of a Ship) is a round Frame of Boards lying upon the Cross-trees near the head of the Mast: Here they furl or loose the Top-sail, &c.

TOP-ARMOURS, are a kind of Cloths hung about the Round-tops of the Masts for show; and also to hide the Men which are in the top in a Fight, who lie there to sling Stink-pots, &c. or to fire small Shot down on the Enemy in case of Boarding.

TOP-GALLANT-Masts of a Ship are two, viz. *Main-top-gallant-Mast*, and *Fore-top-gallant-Mast*: And these two are small round Pieces of Timber, set on to their respective *Top-Masts*; on the Top of which Masts are set the Flag-staffs, on which the Colours, as Flags, Pendants, &c. hang.

TOP-MASTS of a Ship are 4; which are made fast, and settled unto the Heads of the *Main-Mast*, *Fore-Mast*, *Missen-Mast*, and *Boltsprit* respectively.

TOP-ROPES, are those with which the *Top-Masts* are set, or struck. They are reeved thro' a great Block, which is seized on one side under the Cap, and then they are reeved thro' the *Heel* of the *Top-Mast*, where is a Brais *Shiver* placed athwart Ships; after this they are brought up and fasten'd

on either side the Cap with a Ring: The other part of them comes down by the *Ties*, and so is reeved into the *Knighthead*; and when it is to be heaved, is brought to the *Capstan*: These *Top-Ropes* belong only to the *Main*, and *Fore-Mast*.

TOPHUS, is a stony Concretion in any Part of an Animal Body; which is also frequently called a *Tophaceous Matter*.

TOPICK in Medicine, signifies what is outwardly applied to the Patient's Body, to cure him of his Distemper.

TOPICK in *Logick*, is a *Ground*, or *Subject* on which to found, or from whence to draw an Argument in Disputation.

TOPINARIA, is the same with *Talpa*. *Blanchard*.

TOPOGRAPHY, is a particular Description of some small quantity of Land, such as that of a Mannor, or particular Estate, &c. or such as Surveyors set out in their Plots, or make a Draught of, for the Satisfaction, and Information of the Proprietors.

TOPPING the Lifts, is the same as haling the Top-sail Lifts; and therefore they say *Top a Star-board*, or *Top a Port*; that is, hale upon the Star-board or Larboard Lift. See *Lifts*.

TORCE, a Term in Heraldry for a Wreath; which see.

TORCULAR *Herophili* in Anatomy, is that Place where the four Cavities of the *Dura Mater*, or thick Skin of the Brain are joined.

TORE, or *Torus* in Architecture, or as 'tis sometimes spelt *Thore*, is that round Ring which encompasses in the Column, between the *Plinth* and the *Lift*. This is the third Member of the Base of a Column; it seems like a round Cushion, swelling out with the Weight of the Incumbent Pillar.

TORICELLIAN Experiment, so called from its Author, and Inventor *Toricellius* an Italian; is when a Glass Tube of about 3 Foot in Length, and $\frac{1}{2}$ of an Inch Bore being sealed (or closed in the Fire) at one end, is at the other quite filled with Quick-silver; and then being stop't with the Finger, hath its unsealed end thrust down under the Surface of some Quick-silver, contained in a Vessel; and then the Finger being removed from the Orifice, and the Tube put into an erect Posture, the Mercury will descend, or run out till it remain in the Tube, to the height of between 28 and 31 Inches, leaving in the top of the Tube an apparent empty Space.

This Quick-silver thus suspended, hath been found to encrease or lessen its height in the Tube, according as the Weather alters for dry or wet; and therefore when hung in a Frame with a Plate of Divisions for this purpose, 'tis called the Quick-silver Weather-glass, the *Mercurial Barometer*, or *Baroscope*; which Words see.

That the Cause of the Suspension of the Mercury in this Tube, is occasion'd by the Weight of the Atmosphere incumbent on the Orifice of the Tube, and the stagnant Mercury in the Basin over it; is the received Opinion, and seems proved by these Experiments and Reasons.

First, That when a Tube, in which this *Toricellian Experiment* is duly made, is placed (Cistern and all) in the Receiver of the Air-pump; after one Suction the Mercury will descend, and so still will it go lower and lower at every Suction of the Air

Air out, 'till at last the Surface of the Mercury within the Tube, will be a very little higher, than that which is in the Basin: But as soon as the external Air is let into the Receiver again, it will by its Spring (which is always equal to the Gravity of the Atmosphere) so press on the Surface of the Mercury in the Cistern, as to force it up again into the Tube with such Violence as will endanger breaking it, and it will (when quiet) regain near its former height in the Tube.

2. It hath been found by repeated Trials, that the included Mercury will sink if the Tube be carried up to the top of an high Hill, or up but to the Top of an high Tower, Steeple, &c. the reason of which appears to be, that the Column of incumbent Air which pressed upon it before, being now lessened in length by the Altitude of the Hill, must needs gravitate less than at the Bottom, and consequently cannot bear the Mercury up so high in the Tube. And this Mr. Boyle takes to be a kind of *Experimentum Crucis*, determining plainly the Cause of the Mercury Suspension.

3. If after the Experiment is made and the Mercury settled, you lift the Tube out of the stagnant Mercury, the external Air will press in with that Violence, and drive the Mercury up to the Top of the Tube so forcibly, as will endanger the breaking out of the sealed end.

TORID Zone. See *Zone*.

TORRIED, *i. e.* Roasted, it was formerly the usual way to *Torriste* Opium, or roast it against the Fire, before any Medicinal Preparation was made with it, in order to get out some malignant Parts that they tasted were in it before: But by this Means its volatile Spirits and Sulphur in which its great Virtue consists were evaporated and destroyed. And indeed 'tis found by Experience, that in most Cases *Crude Opium* is better than any other Preparation of it whatsoever.

TORTEAUXES, a bearing in Heraldry. See *Balls*.

TORUS, in Architecture, is a round, thick Circle running round the Base of a Pillar, resembling the form of a great Ring.

TOTTED, a good Debt to the King, is by the *foreign Opposer*, or other Officer noted for such, by writing this Word *Tot* to it.

TOUT temps prêt & uncore est, is a kind of a Plea in way of Excuse, or Defence for him that is sued for any Debt, or Duty belonging to the Plaintiff.

TOW, whatever is drawn after a Ship, or Boat with a Rope, &c. is said to be *Towed* after a Ship, or to be in her *Tow*.

TOXICA, are poisonous Medicaments, where-with *Barbarians* use to anoint their Arrows. *Blanchard*.

TRABEATION, in Architecture, is the same with *Entablature*, viz. the Projecture on the Top of the Walls of Edifices which supports the Timber Work of the Roof. *Trabeation*; or *Entablature*, is different according to the several Orders and comprehends the Architrave, Frize, and Cornice.

TRACHEA, the same with *aspera Arteria*; which see.

TRACHOMA, is a Scab, or Asperity of the inner Part of the Eye-lid. *Blanchard*.

TRAGÆA, a Term in Pharmacy; the *Tragæa*

differ not from Powders, but that the Ingredients whereof they are prepared, are not beat so small: And they are applied either in Fumigations, or externally to the Body, by being put into a Linen Bag, and then into Wine or other Liquor, that they may communicate their Strength, and Qualities to it: Sometimes also they are compounded of some sorts of Antidotes, or Counter-poisons, and other odoriferous things, and of simple Medicines reduced into a Powder, with an Addition of Sugar, in order to be taken inwardly. *Blanchard*.

TRAGUS, as *Hircus* (because 'tis sometimes Hairy) is one of the Protuberances of the *Auricula*, being that next the Temple, as that which is opposite to it, and to which the soft Lobe of the Ear is annexed, is called *Antitragus*.

TRAJECTORY, of a *Comet*, is the Line which by its Motion it describes; which *Hewelius* in his *Cometographia*, will have to be nearly a Right one; but it seems rather to be a very Excentrical Ellipsis.

The Excellent Sir *Isaac Newton*, in *Prop. 41.* of his third Book, shews how to determine the Trajectory of a *Comet* from three Observations; and in his next and last Proposition, how to correct a Trajectory graphically described. See *Comets*.

TRAIL-BOARD, in a Ship, is a carved Board on each side of her Beak, reaching from her Main Stem to the Figure, or to the Brackets.

TRAIN, is the Number of Beats which the Watch maketh in an Hour or any other certain time.



TRANCHE, a Word used by the *French* Armors, to express a manner of *Counterchanging* in an Ecutcheon of this Form.

But our *English* Herald's Blazon it thus, he beareth, *Per Pale Argent and Azure, per Bend Counterchanged*.

TRANSCENDENTAL Curves are such; as when their Nature, or Property comes to be expressed by an *Equation*, one of the variable, or flowing Quantities there, denotes a *Curve Line*; and when such *Curve Line* is a *Geometrick* one, or one of the first Degree, or Kind; then the *Transcendental Curve* is said to be of the second Degree or Kind, &c.

TRANSCENDENTAL Quantity. See *Quantity*.

TRANSCRIPTO pedis finis levati mittendo in Cancellarium, is a Writ for the certifying the Foot of a Fine, levied before Justice in Eyre, &c. into the Chancery.

TRANSCRIPTO Recognitionis factæ coram Justiciariis itinerantibus, &c. Is a Writ for the certifying of a Recognizance, taken before Justices in Eyre, &c. into the Chancery.

TRANSFUSION of the Blood, out of one Animal into another, is thus performed: Bind and lay them both down on a Table, and then making strong Ligatures round each of their Necks, open the *Right Jugular Vein* and *Carotid Artery*, of the Man, (if you can get one to try) and the *Left* of the Sheep, &c. (or vice versa): Then dextrously fitting two small Quils, or Pipes, cross-ways from Vein to Artery, so that the Arterious Blood of the Sheep, may run into the Veins of the Man, and the Vepal Blood into his Arteries, the Sheep receiving his after the same manner: And when the rational and sagacious Looks of the Sheep, and the

the Sheepish ones of the Man begin to appear plainly distinguishable, the Operation is well over; separate them and bind up their Wounds; and 'tis done.

Of this *Transfusion*, (if any one hath a fancy to try it) he may find a more large Account in *Philosoph. Transact.* N. 20.

'Twas first (as is said) practis'd by Dr. *Lower*; and by the Honourable Mr. *Boyle* communicated to the *Royal Society*.

And in N. 26. P. 479. of *Philosoph. Transact.* there is an account, that one Mr. *Gayant* of *Paris*, by Transfusing the Blood of a Young Dog into an Old one that was exceedingly Decrepid, and bare his Age very poorly, made the Old Curr so Lively and Brisk, that in two Hours after the Operation was over, he leapt and friskt about with very Youthful Agility.

*So that, Transfusion of the Blood,
Which makes Fools Cattle, did him Good.*

Hudibr.

TRANSGRESSIONE, is a Writ commonly called, a Writ or Action of Trespass, of which *Fitz-Herbert* reckons two sorts. One *Viscountiel* so called, because it is directed to the Sheriff, and is not returnable, but to be determined in the County; the form whereof, differs from the other, because it hath these Words, *Quare vi & armis*, &c. The other is term'd a Writ of *Trespass* upon the Case, which is to be sued in the King's Bench, or Common Pleas, in which are always used these Words, *vi & armis*. See *Trespass*.

TRANSIT, in *Astronomy*, signifies the passing of any Planer just by or under any Fixt Star; or of the Moon in particular, covering or moving close by any other Planer.

TRANSITION, in *Musick*, is when a greater Note is broken into a lesser, to make smooth, or sweeten the roughness of a Leap, by a gradual *Transition*, or passing to the Note next following: whence it is commonly called, the *breaking of a Note*, being sometimes very necessary in musical Compositions.

TRANSLATION, in *Law*, signifies the setting from one Place to another, as to remove a Bishop from one Diocese to another, is called *Translation*, and such a Bishop Writes not *Anno Consecrationis*, but *Anno Translationis nostrae*.

TRANSMUTATION, in *Geometry*, is to reduce, or change one Figure or Body, into another of the same Area, or Solidity, but of a different Form, as a Triangle into a Square; a Pyramid into a Parallelopiped, &c.

TRANSMUTATION of *Metals*, is what the Alchymists call the *grand Operation*, or finding the *Philosophers Stone*; which is such a curious universal Seed of all Metals, that if you melt any Metal in a Crucible, and then put in but a little of this *Stone* or *Powder of Projection*, (as they often call it) into the melted Metal, it will immediately, (as they tell you) turn it into Gold, or Silver, according as they use it.

The Famous Dr. *Dickinson* in his Book de *Quintessentia Philosophorum*, tells the World he was twice shewed this mighty Feat, by an Adept that went by the name of *Mundanus*: To which I shall only say, as Mr. *Boyle* used to do in such Cases, *be that hath seen it, hath more reason to believe it, than he that hath not.*

You have in *Lemery*, Dr. *Dickinson*, and others, long Accounts of the Impositions, and Cheats of several pretended Adepts: How they fix *Mercury* with *Verdegrease*, and then Colour it deeper (for the *Verdegrease* will give it a yellow Colour) with *Turmerick Cadmia*, &c. and then they would pass it thus off for true Gold: But if you should go about to try it by the *Copple*, it will all fly away in Fumes. And indeed nothing produced this way ought to be adjudged true Gold, (unless it have all the Properties of true Gold, for all is not so that Glisters, and looks yellow) that is, it must be able to endure *Coppelling*, *Cementation*, *Purification* with *Antimony*, and the *Depart*. It must have the *Malleability*, and great *Ductility* of that Metal; and especially its true *Specifick Gravity*, i. e. it must be to Water, as 19, or 18 and $\frac{1}{2}$ is to 1, or else 'tis some way false and Counterfeit. And this last Test of Specifick Gravity, would, if not attainable, argue an apparent Impossibility of Transmutation of Metals. Nor indeed can I see how any one can propose to increase the Relative, or Specifick Gravity of any Body whatsoever by a certain and determinate Way; and till this is done, all other Pretences are vain; for let it look how it will, if it have less Specifick Gravity than 18 and a half to 1, it cannot be true Gold; and therefore must either be a mixture of some Gold and other Metals together; or else some of them under the Disguise of Gold.

The trick of turning Cinnabar into Silver, is pretty enough, and ought to be known.

They bruise the Cinnabar grossly, and then *stratise* it in a Crucible with granulated Silver: The Crucible is placed in a great Fire, and after due time for its Calcination, they take it off; and pouring the Matter out, they shew the Cinnabar turn'd into real Silver, tho' the Silver Grains appear in the Number and Form they were put into the Crucible. But the Mischief of all is, when you come to handle the Grains of Silver, you find them nothing but light fraible Bladders which will crumble to pieces between your Fingers: The Silver is almost of it got in and incorporated with the Cinnabar, and the whole weighs no more, nor indeed so much, as it did when it was first put into the Crucible.

But to give you something on the behalf of *Transmutation*, Mr. *Boyle* talks of his own separating from common Mercury; near a fourth part of its weight in clear Liquor, *Sep. Chym. Pag. 134.* and tells us also, that two Friends of his did, by pressing Mercury in a skilfully managed Fire, turn it almost Weight for Weight into Water; but they tell us not in either Experiment, the Specifick Gravity of the produced Water, nor of the remaining untransmuted Mass of Mercury; which unless one knew, there is no judging of the Reality of the *Transmutation*.

In his *Second Essay on the succeeding Experiments* he tells us, that Dr. K. a Person far both from the Temptation and Custom of Lying, assured him he did once light on a kind of *Aqua fortis* with which he did divers times draw a *Volatile Tincture*, which could and did turn Silver into Gold; and that out of an Ounce of Gold he drew as much of this Tincture, as did Transmute an Ounce and a half

half Silver into that Noble Metal: But withal, that designing afterwards to prosecute this surprising Experiment further, he could never again make such an *Aqua fortis* as would draw any such Tincture from Gold. Tho' Mr. Boyle seems inclined to believe the Thing possible, because he himself more than once was able to deprive Gold of its yellow Colour, and to communicate it to a *Menstruum*.

He tells us also in his Origin of Forms, P. 235, That by putting to a Calx of Gold, a good Portion of his *Menstruum Peracutum*, with a little Spirit of Salt, it did slowly, and quietly dissolve it, only at the bottom remained a white Powder which the *Menstruum* would not touch, and which was Indissoluble in *Aqua Regalis*. This white Powder being with Borax, or some such flux Powder melted into a Metal, was found to be white like Silver, yielding to the Hammer, Dissoluble in *Aqua fortis*, or Spirit of Nitre; and would there leave a true Silver Calx, odiously Bitter. This is a strange Experiment, which had Mr. Boyle made any more than once, as I cannot find that he had; and had he tried the Specific Gravity of this apparent Silver, and found it to be less than that of Gold, it had been no small Proof of the Possibility of a Transmutation of Metal.

But what that noble Author relates in another Place of the same Book, about the Transmutation of Water into Earth; I judge the more considerable, because he made use of Hydrostaticks, to examine his Transmuted Matter, viz.

That rain Water being distilled, or re-distilled (by a Friend of his) many times over again (near 200 Times) did after each Distillation, leave at the Bottom of the Glass Body, a *white Earth* in a considerable Quantity; and this was afforded (saith Mr. Boyle) more plentifully in the latter Distillation, than in the first.

This he believed to be a certain Quantity of Water, actually turned into Earth, and it was above twice as heavy (specifically) as common Water, and was of so fixt a Nature, that it lay in a red hot Crucible for a considerable Time, without being diminished in Weight, or emitting any manner of Smoak.

He takes notice also, that an Ounce of Water yielded fix Drams of Powder, a considerable Quantity of Water still remaining behind; and that the Glass in which it was distilled, was not in the least sensibly Damaged thereby. Yet this great Chymist was not without some Scruples about the Experiment. For,

First, He was not satisfied that the remaining Water, was not Lighter than before the Distillation.

Secondly, He was not assured that no Parts of the Glass Vessel were Dissolved, or incorporated with it.

Thirdly, Nor whether Water be truly an Homogeneous Body; for if it be, he thinks it Difficult, if not impossible to conceive that it can be Transmuted: For how can (saith he) the bare Convention of the Parts of a Fluid into a Concrete, alter the Specific Gravity.

TRANSNOMINATIO. See *Metonymia*.

TRANSOM, is the Term which some give to

the Vane of a *Cross-staff*, which is made to slide along upon the *Cross-staff*, by means of a Square Socket; and may be set to any of the Graduations on the Staff, in an Observation.

TRANSOM of a Ship, is that main Piece of Timber which lieth across her Stern at her Burtock, directly under the Gun-room Port; as when a Ship is built broad or narrow at her Transom, she is said to have a broad or narrow Burtock.

TRANSPARENT, or Diaphanous Bodies are such whose Pores probably are all right and nearly Perpendicular to the Plain of their Surface, and so consequently do let the Rays of Light pass freely thro' them, without being refracted: Whereas the Pores of *Opacous Bodies* are in crooked oblique Position, by which means the Beams of Light cannot pass freely thro' them, but are variously refracted and lost.

TRANSPARATION, a Breathing through, as of Vapours through the Pores of the Skin. *Blanchard*.

TRANSPPOSITION of Equations. See *Equation*.

TRANSVERSALIS *Colli*, is a Muscle of the Neck, which ariseth fleshy from all the Transverse Processes of the *Vertebrae* of the Neck, except the first and second, and is inserted after an oblique ascending Progress to their Superior Spines; it being a Continuation of the same Series of Muscular *Fibres* that compose the *Sacer* and *Semispinatus*: If either of those Muscles act, the *Vertebrae* of the Neck are moved obliquely backwards, as when we look over one Shoulder.

TRANSVERSALIS *Musculus*, one of the Muscles of the Abdomen, so called, because its Fibres run across the Belly: Its use is to compress the Abdomen exactly inwards, in *Expiration*.

TRANSVERSALIS *Pedis*, is a Muscle of the Foot so called from its Transverse situation; it ariseth Tendinous from the Internal *Os Sesamoides* of the Great Toe, and becoming a fleshy Belly in its Progress over the first internodes of the two next Toes, it is lessened at its Insertion to the Inferior part of that *Metatarsal* Bone, which supports that Toe next the lesser. Its use is to bring the lesser Toe towards the greater.

TRANSVERSALIS *Penis* is a Pair of Muscles arising near the *Erectores Penis*, and thence pass transversely to their Insertions at the upper part of the Bulb of the Cavernous Body of the *Urethra*: They have this Name for their Situation. They are mentioned by *Lindanus* after *Aguapendens*, as *Bartholin* observes, *Lib. 1. cap. 24*.

TRANSVERSALIS *Sutura*, is a Suture which runs across the Face; it passes from one Temple to another transversely, over the Root of the Nose, joining the *Os Frontis*, and the *Synicrut*: 'Tis the first of the true Sutures, and is usually called, *Coronalis*.

TRANSVERSE *Axis*, or *Diameter*. See *Latus Transversum*.

TRAPEZIUM, see under *Quadrilateral Figures*. For its Superficial Content. See *Area*.

TRAPEZIUM, is a Muscle of the Shoulder-blade, which serves to move it upwards, backwards, and downwards.

TRAPEZOID, is a solid irregular Figure, having four Sides not parallel to one another.

TRAVAILING-BAROSCOPE, the same with *Portable Barometer*.

TRAVERSE,

TRAVERSE, a Term in *Gunnery*, signifying to turn a Piece of *Ordnance* which way one pleases upon her *Platform*.

TRAVERSE, a Sea Word used in these Senses; they call the Way of a Ship when she makes Angles in and out, and cannot keep directly to her true Course, a *Traverse*.

Also the laying and removing a Piece of Ordnance, or great Gun, in order to bring it to bear, or lie level with the Mark, is called *Traversing* the Piece.

TRAVERSE, in Navigation, is the Variation or Alteration of the Ship's Course, upon the shifting of Winds, &c.

Note, That in Sailing in respect of the Wind, is either *before a Wind*, *by a Wind*, or *Largely*.

If a Ship Sail by or against a Wind, there ought to be an allowance for her Lee-way, and that more or less, according to the Growth, and Suage of the Sea, Mould of the Ship, and Sail she bears, &c.

E X A M P L E.

Of a Traverse.

A Ship from Latitude 47 Degrees, 00 Minutes N. Sails S. E. by S. 23 Miles, and then Sails S. W. by W. 31 Miles, and afterwards W. N. W. 40 Miles; lastly, N. 28 Miles.

I demand the Course and Distance failed from the first Place of Departure, and the Latitude she is now in.



Geometrically.

First, Draw the Meridian Ab , with 60 Degrees from the Chords, describe the Arch bc ; which make equal to 33 Degrees 45 Minutes = 3 Points; draw Ac , and make Ad , or Ac equal to 23 Miles.

Secondly, Draw de parallel to Ab ; from d , with 60 Degrees of the Chords, describe ef , which make equal to 5 Points, draw gf , for 31 Miles from d to g .

Thirdly, Draw gh parallel to Ab ; with 60 Degrees of the Chords describe hi , which make equal to 6 Points; draw gi , for 40 Miles from g to k .

Fourthly, Draw kl parallel to Ab , make kl equal to 28 Miles; draw lA , that measured on the *Equal Parts*, gives 50, 4 Miles, and the Angle Alk measured on the Chords, gives 82 Degrees, or $7\frac{1}{2}$ Points from the *Meridian*; so that if she had sail'd on a straight Line, and single Course from A to l , that Course had been W. by N. $\frac{1}{4}$ Westerly, and the Distance 50, 4 Miles.

By the Logarithms.

As the Radius ————— 10,00000
Is to the Dist. of the first Course 23 Mil. 1,36172
So is the S. Compl. of the Co. S. $56^{\circ} 15' - 9,91984$

To the Diff. Lat. in the first Cou. 19, 1 M. 1,28156
Then, as the Radius ————— 10,00000

Is to the Distance Ad 23 Miles ————— 1,36172
So is the S. $33^{\circ} 45' = \sqrt{d} A b$ the first C. 9,74473

To the Departure in the first Course 12, 8, 1, 10646

Thus proceeding with the several Courses, and Distances given, find the Departures, and Difference of Latitude to them all.

If the Course be between the North and East, then the Difference of Latitude is called Nothing, and the Departure Easting; if the Course be in the North-west Quarter, then the Difference of Latitude is called Nothing, and Departure Westing. If the Course be between the South, and East, the Difference of Latitude is called Southing, and the Departure Easting, &c.

Now place all the said Differences of Latitude, and Departures in a Table, the Northings all under one another, under the Title *Northing*, and the Southings, under the *Southing*; the Eastings in the East Column, and the Westings in the West Column.

Then add up all the Northings, as likewise the Southings, and so the Eastings, and also the Westings: Lastly, Take the Sum of the Northings, from that of the Southings, if the Southings make most; or the Sum of the Southings from the Northings, that you may have their Third Difference, which is the Difference of Latitude; as also, the Difference of the Totals, of Easting, and Westing for the Departure; by which Difference of Latitude, and Departure, according to *Case 5* of Right-angled Triangles, you will find the Direct Course and Distance.

Course.

Courfe.	Points.	Distance.	North.	South.	East.	West.
S E by S	3	23		19,12	12,78	
S W by W	5	31		17,22		25,78
W N W	6	40	15,31			36,96
North.	0	28	28,00			
From Sum take			43,31 36,34	36,43	12,78	62,74 12,78
Refts.			6,57			49 96 Dep. West

Departed }
 Difference of } Latitude { $47^{\circ} 00'$ North.
 Present } $00^{\circ} 07'$
 { $47^{\circ} 07'$ North.

As the Difference of Latitude 7 Miles—0,845098

Is to the Radius ————— 10,000000

So is the Departure 49,9 ————— 1,698100

To the Tan. of the Course 82,1 ————— 10,853002

And,

As the S. of the Course $82^{\circ} 1'$ ————— 9,995770

Is to the Departure 49,9 Miles ————— 1,698100

So is the Radius ————— 10,000000

To the Distance 50,4 Miles ————— 1,702330

Example 2.

A Ship being bound to the Eastward, and finding the Wind variable, a small Gale, and smooth Water, plies upon these several Courses, with the Distances on each Course; as followeth.

The Lar-board Tack on Board, Wind from S S W to S, and so to S S E and E.

	Miles
South-East by East half Easterly	5
East South-East	4
East by South	7
East half Northerly	3

The Star-board Tack on Board, the Wind S E, E S E, E, &c.

South South-West	5
South by West	6
South	4
South South-East	7
South-East by South	3

The Direct Course and Distance from the first place of Departure is requir'd.

The Work by the Traverse Table.

Courfe.	Points	Dist.	North.	South.	East.	West.
S E by E $\frac{1}{2}$ Ely	$5\frac{1}{2}$	5		2 36	4 41	
E S E	6	4		1 53	3 70	
E by S	7	7		1 37	6 86	
E $\frac{1}{2}$ Nly	$7\frac{1}{2}$	3	0 29		2 98	
S S W	2	5		4 62		1 91
S by W	1	6		5 88		1 17
South	0	4		4 00		0 00
S S E	2	7		6 47	2 08	
S E by S	3	3		2 49	1 67	
Sum			0 29	28 72 0 29	21 70 3 08	
				28 43	18 62	

Having set down the several Courses, and Distances, then in the *Traverse Table* find the Course on the Head of the Table, if under four Points, but at the bottom, if above four Points; and look the Distance in the Left Hand Column, and in the

Square meeting will be the difference of Latitude and Departure under the respective Titles.

Thus, above $5\frac{1}{2}$ Points, and right against 5 m, I find over Title Diff. Lat. 2 36 m, the Difference of Latitude, and over Dep. 4. 14, the Departure, in the

the first Course, which being placed in their proper Columns, according as they are Northing or Southing, &c. Proceed in like manner with all the other Courses or Distances entering and corresponding Differences of Latitude and Departures in their Columns: Then add up the Columns of Diff. of Lat. and Departure, Subtracting the lesser Difference of Latitude from the greater, and the lesser Departure from the greater, and the Remainders are the whole Difference of Latitude and Departure she hath made from the Place of her Departure; so in this Example, she's 28, 43 *m* to the South of the Place of her Departure; and 18, 62 *m* East, with which by Case 5th I find her Course S E by S 2 Southerly, and Distance 34 5 *m*.



TRAVERSE. There is also a Partition of an Escutcheon us'd in Heraldry of this Figure, which they call *Parted per Pale Traverse*.

Argent and Gules.

TRAVERSE, is also a Word much used in Answer to Bills in *Chancery*; or it is that which the Defendant pleadeth or saith in Bar, to avoid the Plaintiff's Bill, either by confessing or avoiding, or by denying and *traversing* the material parts thereof.

To *traverse* an Office, is nothing else but to prove, That an Inquisition made of Lands or Goods by the Escheator, is defective, and untruly made. And to *traverse* an Indictment, is to take Issue upon the chief Matter, and to contradict or deny some Point of it.

TRAVERSE, in Fortification, is a little Trench bordered with two Parapets, viz. One on the right Side, and another on the left, which the Besiegers make quite thwart the Mouth of the Place, to pass secure from Flank-shot, and to bring the Miners to the Bastions.

This *Traverse* is usually covered on top with Hurdles or Bains laden with Earth, for Security from the Fire-works, and differs from a Coffre only in this respect, That it is made by the Besiegers, and the other by the Besieged.

This Word is now often us'd for any Retrenchment or Line Fortify'd with Fascines, Gabions Barrels, Bags of Earth, &c.

TRAVERSE-Board, is a little round Board hanging up in the Steerage of a Ship, and bored full of Holes upon Lines showing the Points of the Compass; upon it, by moving of a little Peg from Hole to Hole, the Steers-man keeps an account how many Glasses (that is, half Hours) the Ship Steers upon any Point.

TRAUMATICKS, are those things which being taking in Decoctions and Potions, fetch the ferrous and sharp Humours out of the Body, and so attenuate the Blood, that it may be conveniently driven to the wounded, broken, or bruised Parts. *Blanchard.*

TREASON, is of two sorts, viz. *High* and *Petty Treason*. *High Treason* is defined to be an Offence committed against the Security of the King or Kingdom, whether it be by Imagination, Word or Deed; as to compass or imagine the Death of the King, Queen, or Prince; or to De-flower the King's Wife, or his eldest Daughter un-

married, or his eldest Son's Wife; or levy War against the King in his Realm, adhere to his Enemies, counterfeit his Great Seal, Privy Seal, or Money: To Kill the King's Chancellor, Treasurer, Justices of either Bench, Justices in Eyre, of Assize, or of Oyer and Terminer, being in their Place, doing their Office; diminishing or impairing current Money, and many others, as may be seen in divers Statutes particularly express'd. In case of this *Treason*, a Man shall be Hang'd, Drawn and Quartered, and forfeit his Lands and Goods to the King. It is sometime called *Treason Paramount*, *Petty Treason*. See the Word it self in its proper place.

There is also mention of *Accumulative Treason*, and *Constructive Treason*, in the Statute 14 Car. 2. cap. 29. And here Note, That in *Majori prodicione omnes sunt principales*, there are no Accessaries in *Treason*, all are Principals. And *Voluntas non reputabitur pro facto nisi in causa Prodicionis*, for *Petty Treason*.

TREASURE-TROVE, is when any Money, Gold, Silver, Plate, or Bullion is found in any Place, and none knows to whom it belongs; then the Property thereof belongs to the King, but the Civil Law gives it to the Finder, according to the Law of Nature. The Punishment for concealing *Treasure found*, is Imprisonment and Fine. But if any Mine or Metal be found in any Ground, that always pertains to the Lord of the Soil, except it be a Mine of Gold or Silver, which used to be always to the King, in whose Ground soever it be found; But by a late Act of Parliament, the King hath only the *Preemption*.

TREBLE, is the last or highest of the four Parts in *Musical Proportion*.

TREENELS, in a Ship, are long Pins or Nails of Wood, whence they are called *Tree-nells*, or *Tree-nails*, made out of the Heart of Oak, to fasten the Planks to the Timber; and these have always Oakum, driven into them to prevent any Leak.

TREES and *Shrubs*, of our Native Growth in *England*, are thus distinguished by our most judicious Botanist, Mr. *John Ray*.

I. Such as have their Flower disjoined and remote from the Fruit; and these are.

1. *Nuciferous ones*, or such as bear Nuts, as the Walnut Tree, the Hazel Nut-tree, the Beach, the Chestnut, and the common Oak.

2. *Coniferous ones*, or such as bear a squamose or scaly Fruit, of a kind of Conical Figure, and of a woody or hard Substance, in which are many Seeds, which when they are Ripe, the Cone opens or gapes, in all its several Cells and Partitions, and so they drop out. Of this kind are the *Scotch Firs*, Male and Female; the Pine, which in our Gardens is called the *Scotch Fir*; the common Alder Tree, and the Birch Tree.

3. *Bacciferous ones*, or such as bear Berries; as Juniper, and the Yew Tree.

4. *Lanigerous ones*, or such as bear a woolly downy Substance; as the black, white, and trembling Poplar, Willows, and Osiers of all kinds.

5. Such as bear their Seeds (having an imperfect Flower) in Leafy Membranes or Cafes; as the *Horn-beam* of *Hardbeam*, called in some places the *Hornbeech*.

II. Such as have their Fruits and Flowers Contiguous; and these are either with the Flower placed on the Top of the Fruit, or else have it adhering to the Base or Bottom of the Fruit.

1. Trees and Shrubs with the Flower placed on the Top or Upper-part of the Fruit: Of these, some are *Pomiferous*, as Apples and Pears; and some *Bacciferous*, as the Sorb or Service Tree; the White or Haw Thorn, the wild Rose, Sweet-brier, Currants, the great Bilberry Bush, Honey Suckle, Ivy, &c.

2. Trees whose Flower adheres to the Base or Bottom of the Fruit, are either such as have their Fruit moist and soft when Ripe, as

1. *Pruniferous ones*, whose Fruit is pretty large and soft, with a Stone in the middle; as the black Thorn or Slow-Tree, the black and white Bullace Tree, the common wild Cherry-Tree, the Black Cherry, &c.

2. *Bacciferous ones*; as the Strawberry Tree, in the West of Ireland, Mistletoe, Water Elder, the Dwarf or large Lawrel, the Viburnum or way-faring Tree, the Dog-berry Tree, the Sea black Thorn, the Berry-bearing Elder, the Privet Barberry, common Elder, the Holly, the Buck Thorn, the Berry-bearing Heath, the Bramble and the Spindle Tree, or Prickwood.

Such as have their Fruit dry when 'tis Ripe; as, the Bladder Nut-Tree, the Box-Tree, the common Elm and Ash, the Maple, the *Gaule* or *Sweet-Willow*, common Heath, Broom, Diers Weed, Furze or Gorse, the Lime-Tree, &c.

TREMOR, is a voluntary Motion depraved, by which the Member is sometimes raised up, and sometimes depressed through the mutual Contraction between the Faculty and the Part affected.

TRENCHES, in Fortification, are certain Moats or Ditches, which the Besiegers cut to approach more securely to the Place Attack'd, and are of several sorts, according to the different nature of the Soil; for if the adjacent Territory be Rocky, the Trench is only an Elevation of *Bavins*, *Gabions*, *Wool-packs*, or Shouldrings of Earth cast up round about the Place: But where the Ground may be easily open'd, the Trench is dug therein, and border'd with a Parapet on the Side of the Besieged. The Breadth of it ought to be from 8 to 10 Foot, and the Depth from 6 to 7.

These Trenches are to be carried on with winding Lines, in some manner parallel to the Works of the Fortrefs, so as not to be in view of the Enemy, nor to expose its Length to their Shot, which they call *Enfilading*; for then it will be in danger of being *Enfiladed*, or scoured by the Enemies Cannon: And this carrying of the Trenches obliquely, they call, carrying the Trenches by *Coudees* or *Traverses*.

They call it *Opening the Trenches*, when the Be-

siegers begin to Work upon the Line of Approaches, and this is usually done in the Night, and sometimes within Musket-shot, and sometimes within half or whole Cannon-shot of the Place, if there be no rising Ground about it, the Garrison Strong, and their Cannon well served. The Workmen that open the Trenches, are always Supported by Bodies of Men against the Sallys of the Besieged; and sometimes those bodies lie between them and the Place, as also on their Right and Left. The Pioneers sometimes Work on their Knees, and the Men that are to support them, lie flat on their Faces, in order to avoid the Enemies shot: And the Pioneers are also usually covered with *Mantelets* or *Saucissons*. They also say, *Mount the Trenches*; that is, go upon Duty in them: And to *Relieve the Trenches*, is to Relieve such as have been upon Duty there. To *Carry on the Trenches*, is to advance them towards any Place.

TREPANUM, the same with *Mediolus*; which see.

TRESPASS, signifies any Transgression of the Law under Treason, Felony, or Imprison of either; for a Lord of the Parliament to depart from thence without the King's Licence, is neither Treason nor Felony, but *Trespafs*.

But this Word is most commonly used for that Wrong or Damage which is done either to the King in his Forest, or by one private Man to another; and according to this Signification, it is of two sorts; *Trespafs General*, otherwise called *Trespafs vi & armis*; and *Trespafs Special*, otherwise called *Trespafs upon the Case*; and this seemeth to be without Force, howbeit they are sometimes confounded. How to distinguish the Forms of these Writs or Actions, see F. N. B. Fol. 86, 87. In an Action of *Trespafs*, the Plaintiff always Sues for Damages, or the Value of the Hurt done him by the Defendant. There is also *Trespafs local*, and *Trespafs transitory*. *Trespafs local*, is that which is so annexed to the Place certain, that if the Defendant joyn issue upon a Place, and traverse the Place only by saying *absque hoc*, That he did the *Trespafs* in the Place mentioned in the Declaration, and aver it, it is enough to defeat the Action. *Trespafs Transitory*, is that which cannot be defeated by the Defendant's traverse of the Peace, because the Place is not material: But the Action of *Trespafs quare clausum fregit*, ought to be *Local*.

TRESSSEL-TREES, in a Ship, are those Timbers of the Cross Trees that stand along Ships, or Fore and aft at the tops of the Masts. See *Cross Trees*.

TRESSURE, a term in Heraldry for an Orle when it is flowered; and if there be two of them, it is called a double Tressure. See *Orle*.

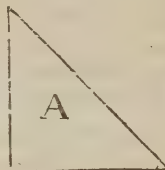
TRIA *Primæ*, are Salt, Sulphur, and Mercury, the Three Hypothetical Principles of the Chymists, out of which they pretend that all mix'd Bodies are compounded, and into which they are ultimately resolvable by Fire; but the latter is false, and the first impossible to be proved.

TRIAL, in Law, is used for the Examination of all Causes, Civil and Criminal, according to the Laws of the Realm, before a proper Judge: Of which there are divers kinds; as Matters of Fact shall be tried by the Jurors; Matters of Law, by the Justices; Matters of Record, by the Record it self. A Lord of Parliament, upon an Indictment of Treason or Felony, shall be Tried without any Oath by his Peers, upon their Ho-

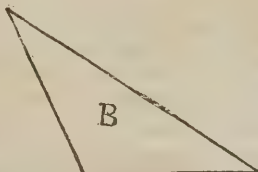
nours and Allegiance; but in Appeal at the Suit of any Subject, they shall be Tried *per bonos & legales homines*. If ancient Demefine be pleaded of a Mannor, and denied, this shall be Tried by the Record of *Doomsday*. Bastardy, *Excommenement*, Lawfulness of Marriage, and other Ecclesiastical Matters shall be Tried by the Bishop's Certificate.

TRIANGLE, is a Figure having three Angles and three Sides only, and is either *Spherical*, (which see) or *Plane*; whose Sides are Right Lines. Every *Plane Triangle* may be consider'd with relation either to its Angles, or its Sides. As to its Angles 'tis either,

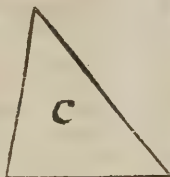
1. *Right Angled Triangle*, is that which hath one *Right Angle*, as A.



2. *Obtuse Angled Triangle*, is such as hath one *Obtuse Angle*, as B.



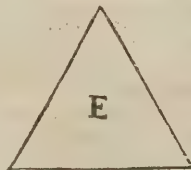
3. *Acute Angled Triangle*, is that which hath all its Angles *Acute*, as C.



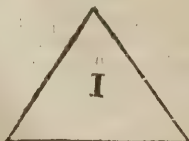
N. B. Any Triangle that is not Right Angled is called *Oblique Angled*, or *Amblygonial*.

A Triangle, as to its Sides, is either,

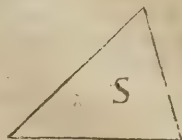
1. *Equilateral Triangle*, is that which hath all its Sides equal to one another, as E.



2. *Isosceles*, or an *Equilegg'd Triangle*, is that which hath only two Sides equal, as I.



3. *Scalenous Triangle*, is that which has no two Sides equal, as S.

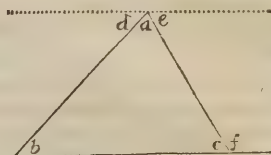


To find the *Area* of all Triangles, see *Area*.
Of the *Properties of Plane Triangles*.

PROPOSITION I

In every Triangle, the sum of all the three Angles is equal to two Right ones; and the external Angle made by any Side produced, is equal to the sum of the internal and its opposite.

I say, 1. $a + b + c = 2 \text{ } \checkmark$
2. $f = b + a$



Draw the prick'd Line through the Vertex parallel to the Base: Then will the Angles d and e be severally equal to the alternate ones b and c . (29 *é*. 1. *Eucl.*) But $d + a + e = 180$ (by *Cor.* 2. 13 *é*. 1. *Eucl.*) Wherefore $b + a + c = 180$. Q. E. D.

And since $c + f$ are also equal to 2 180 (13. *é*. 1. *Eucl.*) if c be taken from both, there must remain $f = b + a$. Q. E. D.

COROLLARY I.

Hence no Δ can have 2 obtuse or 2 180 .

COROL. II.

In a Right-angled Δ , the 2 oblique Angles must make a right one between them.

COROL. III.

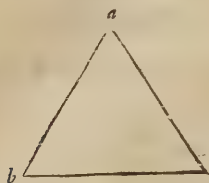
If 2 Angles in one Δ be $=$ to 2 in another, the remaining Angles must also be equal.

PROP. II.

In the same Triangle, equal Sides subtend, and are subtended by equal Angles.

I say, if $a = b$, then $a c = c b$.

Because

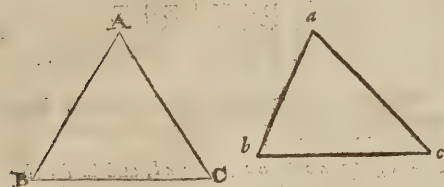


Because the Angles a and b are equal, the Lines $a c$ and $c b$ must be equally inclined to the Base $a b$; and consequently, be so at the Point c where they meet, and therefore c must be equidistant from a and b ; for if c be nearer to, or farther from b than a , it must be because the Angle a is less or greater than b , which is contrary to the Supposition.

And on the other hand, if the sides are equal, the Angles must; for being equal, they must needs be equally inclined to the Base $a b$, in the Point c , where they meet.

PROP. III.

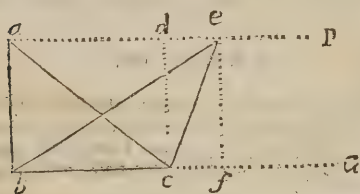
In two Triangles $A B C$, and $a b c$, if all the three Sides, or two Sides and one Angle, or two Angles and one Side be respectively equal one to another, the whole Triangles are equal.



For being laid one on another, they will concur.

PROP. IV.

Triangles on the same Base, and having the same Height, (that is, being between the same parallel Lines) are equal.



I say the Triangles $a b c$, and $e b c$, having the same Base $b c$, and between the same parallel Lines $a p$ and $b c$, are equal.

Draw $d c$ and $e f$ parallel to $a b$.

1. The Triangles $d c e$ and $e c f$ are equal, because each equal to half the Parallelogram $d f$.

2. The Triangles $a b c$ and $e b c$ are also equal, being each equal to half the Parallelogram $a f$.

3. But $\triangle a b c + \triangle e c f =$ half the $\square a f$.

4. And $\triangle e b c + \triangle e c f =$ half the $\square a f$.

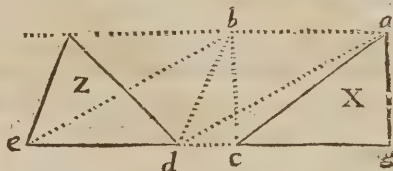
Therefore, if the $\triangle e c f$ be taken away from both Sides, the $\triangle e b c$ must remain $=$ to the Triangles $a b c$. Q. E. D.

PROP. V.

Triangles on equal Bases, and between the same Parallel Lines, are equal.

I say $\triangle Z = \triangle X$.

Draw $b c$ parallel to $a g$ join $d a$, $d b$, and $b e$.



1. $\triangle Z = e b d$ (per preced.) $= a b d$, because 'tis half the $\square a b e d$.

2. $\triangle a b d = a b c$ (per preced.) $= \triangle X$, because 'tis half the $\square a b c g$.

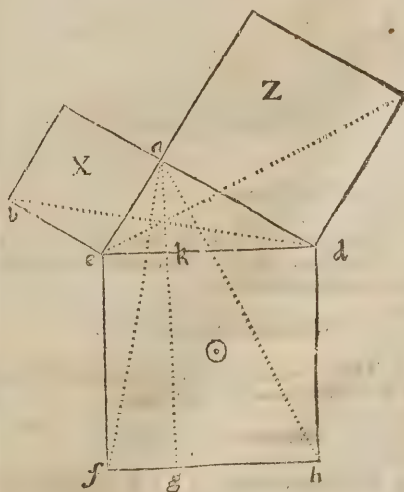
Wherefore $\triangle Z$ must be equal to $\triangle X$. Q. E. D.

COROL.

Hence follows, that if two Lines have between them equal Triangles on the same or equal Bases; these Lines must be Parallel to each other.

PROP. VI.

I say the Square of the Hypotenuse ($e d$) of a Rect^d angled \triangle ($e a d$) is equal to both the Squares of the 2 other Sides ($a e$) and ($a d$).



That is,

$$\square O q_3 = Z = q_3 + X q_3$$

$\square O q_3$

$$1. Oq; = \square kf + \square kb.$$

2. $\frac{1}{2} \square kf = \triangle fae$, and $\frac{1}{2} \square kb = \triangle adb$; because \square s on the same Bases, are double to \triangle s that have the same perpendicular height, or are between the same parallel Lines.

3. But $\triangle fae = \triangle bed$, and the $\triangle bda = \triangle ecd$, as having severally two Sides and one Angle in one equal to those in the other. The two equal Sides, are the Sides of the Square, and the obtuse Angle $bed = ecd$.

4. Now $\frac{1}{2} Xq; = \triangle bed$, and $\frac{1}{2} Zq; = \triangle dce$, (by the Proof in the Second Step.)

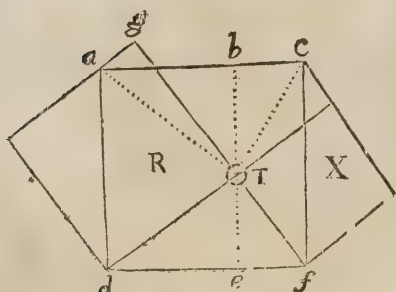
5. Therefore $\frac{1}{2} Xq; = \frac{1}{2} \square kf$, and $\frac{1}{2} Zq; = \frac{1}{2} \square kb$ (by comparing together the 2d, 3d and 4th Steps.)

6. And consequently, $Xq; = \square kf$, and $Zq; = \square kb$, (for if the halves are equal, the wholes must.)

Wherefore $Xq; + Zq; = Oq;$ (by the first Step.) Q. E. D.

The Second way.

I say the Square of $df =$ Sum of the Squares of do and of



$$1. \square df = \square ae + \square ec.$$

2. The $\triangle aod = \frac{1}{2} \square dg$, and also $= \frac{1}{2} \square ae$, because on the same Base, and between the same Parallels with both.

$$\text{Wherefore } \square dg = \square ae.$$

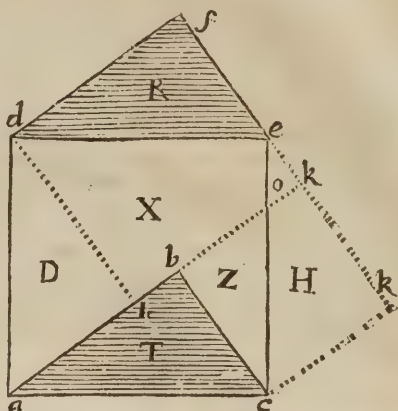
3. The $\triangle cof = \frac{1}{2} \square X$, and also $= \frac{1}{2} \square ec$ for the reason given in the 2d Step.

$$\text{Wherefore } \square X = \square ec.$$

4. And consequently, $\square dg + \square X$ is equal to $\square df$, (by Step 1.) Q. E. D.

The Third way.

$$\text{I say, } acq; = abq; + bcq;$$



Make $bk = to ab$, and compleat all the Squares.

Then will,

$$\begin{aligned} \square ac &= D + X + Z + T, \\ \square ab &= X + R + O, \\ \square bc &= Z + H. \end{aligned}$$

Wherefore taking away what is common, Remains $D + T = R + H + O$. But then,

$R = T$, bec. $ac = de$, $df = ab$, and $\angle f = \angle b$.

Remains to be proved, that

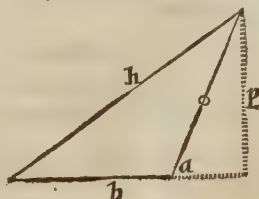
$D = H + O$. Which it is, because $D = R$ (as having 2 Sides and one \angle) and R was proved $= T$, and $T = O + H$, because $ac = ce$, the Angle at $b = k$, and the Angle $acb = eck$ (because each with bce makes a \angle .)

Wherefore, the Square of $ac = abq; + bcq;$ Q. E. D.

PROP. VII.

In an Obtuse-angled Triangle, the Square of the Side subtending the Obtuse Angle, exceeds the Sum of the Squares of the other two Sides by the double Rectangle, ($2ba$) under the Base, and the part added to it.

Let fall the Perpendicular p , and produce b , till it meet with it.



Demonstration.

$$1. bb = bb + 2ba + aa + pp.$$

$$2. \text{ And } oo = pp + aa.$$

$$3. \text{ But } bb + oo = bb + aa + pp.$$

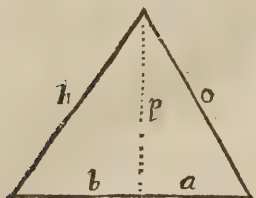
Wherefore bb exceeds the last Step by $2ba$.

Q. E. D.

PROP. VIII.

In an Acute-angled Triangle, the Square of the Side (h) subtending an Acute, is less than the Sum of the Squares of the other two Sides, by double the Rectangle under the whole Base, ($b + a$) and the Segment of the Base (a) which is next to the Acute-angle.

Let fall the Perpendicular p .



Demonstration.

$$1. bb = bb + pp.$$

$$2. oo = pp + aa.$$

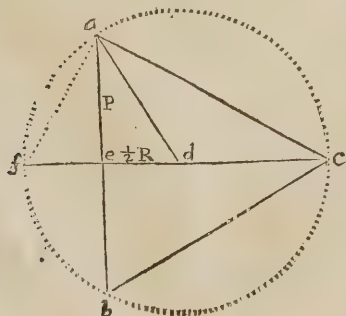
$$3. \text{ Q. } b + a = bb + 2ba + aa.$$

4. $bb + pp + 2aa + 2ab$, is the Sum of the Squares of the Legs.

Wherefore bb is less than that by $2aa + 2ab$, which is plainly equal to the Double Rectangle under the whole Base, and the part a .

PROP. IX.

The Side abc of an Equilateral Triangle, abc , inscribed in a Circle, is in Power Triple of the Radius; or its Square is equal to thrice the Square of the Radius, a d .



Let the Radius be called R , and consequently its Square RR .

I say, then $de = \frac{1}{3}R$, for the two Triangles fea , and ead , are equal, as having two Angles and one Side Equal, in both. Wherefore the Square of $ed = \frac{1}{3}RR$; which being subtracted from RR , leaves $PP = \frac{2}{3}RR$. Wherefore $P = \sqrt{\frac{2}{3}RR}$; and consequently its double $ab = 2\sqrt{\frac{2}{3}RR}$; i.e. to the $\sqrt{\frac{4}{3}}\sqrt{RR}$, or to $\sqrt{3}RR$. Wherefore $3RR = \square$ of ab ; or $abp = 3RR$. Q. E. D.

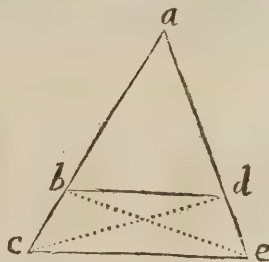
N. B. Herein is founded Euclid's way of generating a Tetrahedrum, and inscribing it in a given Sphere. See Prop. 13 ϵ 13.

PROP. X.

The Sides of a Triangle are cut Proportionably by a Line drawn Parallel to the Base.

That is, it makes, $ab : bc :: ad : de$.

Draw the Lines be and cd .



Demonstration.

1. The Triangles bdc , and bde , are equal, because on the same Base, and between the same Parallels. Therefore the Triangle abd , will have the same Proportion to them both, i.e. $abd : bdc :: abd : bde$. But the Triangle abd , having the same height with the two equal Triangles bdc , and bde , will be to them as its two Sides ab and ad , are to their Bases bc and de .

Therefore $ab : bc :: ad : de$.

Which Proportionals, may be considered and varied according to the several Species of Proportion.

As by Inversion, $cb : ab :: dc : de$: the Parts of the Legs below the Parallel, are Proportional to those above it.

Also Alternately, $ab : ad :: eb : de$. The Part of one Leg above the Parallel, is to the Part of the other Leg above the Parallel, as the Parts below are to one another.

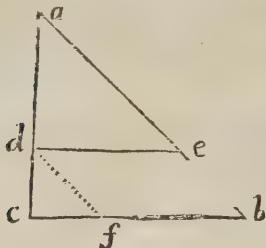
The same thing may be done by Composition and Division, &c.

PROP.

PROP. XI.

In a Triangle, a Parallel to the Base, is to the Base, as the Parts above the Parallel are to the whole Legs.

That is, $de : cb :: ad : ac :: ae : ab$.



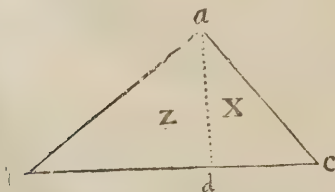
Draw df parallel to eb .

Then will $fb = de$: Therefore 'twill be $bf : fc :: da : dc$: And by Inversion, $fc : bf :: dc : da$. And then by Composition, $fc + bf (i.e. bc) : bf (i.e. de) :: dc + da (i.e. ac) : da$; or as $cb : de :: ac : da$.

Which Inverted, gives $de : cb :: da : ac$. Q. E. D.

PROP. XII.

In a Right-angled Triangle (abc) a Line (ad) drawn from the Right-angle at the Top, Perpendicular to the Hypotenuse (bc) divides the Triangle (abc) into two other Right-angled Triangles, which are similar to the first Triangle, and to one another.



1. For all three Triangles have one Right-angle. And the Triangles abc , and abd , have the Angle b (common to both) and consequently the third Angle $b a d$, must be equal to c . Wherefore these two Triangles are similar.

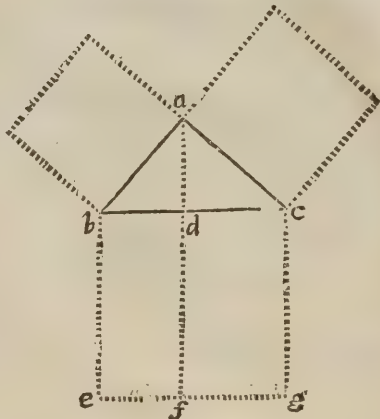
2. The Case is the same, as to the Triangles abc and adc : But the Triangles abd and adc , being similar to the great one abc , must be also similar to one another. Q. E. D.

From the Similarity of which three Triangles, it will follow, that the Sides about the Equal Angles are proportional (by 4. 6. Eucl.) and thence arises the Proof of the next Famous Proposition; by this means proved a fourth way.

PROP. XIII.

In every Right-angled Triangle, the Square of the Hypotenuse is equal to the Sum of the Squares of the other two Sides.

I say, $\square bc = \square ba + \square ac$.



Demonstration.

1. For the Square bg is made up of the two Rectangles bf and dg .

But $\square bf = \square ba$, for $cb : ba :: ba : bd$. That is, $\square ba = cb \times bd = \square bf$. And $\square dg = \square ac$, for $bc : ac :: ac : cd$. That is, $\square ac = bc \times cd = \square dg$. Wherefore $\square bc (= \square bf + \square dg) = \square ba + \square ac$. Q. E. D.

COROLLARY.

Hence 'tis plain, That any Figure made on the Hypotenuse of any Right-angled Triangle, shall be equal to two other similar Figures made on the Sides. Because all such Figures are to one another, as the Squares of their Homologous Sides.

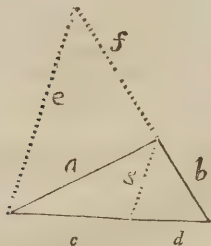
You have above three other ways of demonstrating this admirable Proposition, without the Doctrine of Proportion being first learnt.

P R O P. XIV.

If any Angle of a Triangle be bisected, the Bisecting Line will divide the opposite Side in the same Proportion as the Legs of the Angle are to one another.

Let the Sides of the Triangle be a , b , and $c + d$, and the Bisecting Line s ,

I say, $a : b :: c : d$.



Produce the Leg b , till $f = a$ the other Leg of the Angle, and draw the Line e . Then will the Triangle ef be an *Isoceles*; and consequently the Angles at the Base e , will be equal: And therefore each will be equal to half the bisected Angle, (because that is external and equal to them both:) Therefore in the first Triangle, the Bisecting Line s is parallel to the Base e ; and consequently, $f : b :: c : d$.

That is, $a : b :: c : d$? Q. E. D.

TRIANGULAR Compasses, are such as have three Legs or Feet to take off any Triangle at once; they are used in Maps, Globes, &c.

TRIANGULAR Quadrant, is a Sector, with a loose Piece to make it an *Equilateral Triangle*; the Calendar is graduated on it, with the Sun's Place, Declination, and many other useful Lines, and by the help of a String and a Plummer, and the Divisions graduated on the loose Piece, it may be made to serve for a Quadrant.

TRIANGULARE Ossiculum, the Triangular little Bone, is that which is placed betwixt the Lambdoidal Suture of the Scull, and the *Sagittalis*. Blanchard.

TRIANGULARIS, a Muscle of the *Thorax*, which with its Partner, lies on each Side the *Cartilago Eniformis*, within the Cavity of the *Thorax*, under the *Sternum*; sometimes this appears to be three, at other times four distinct Muscles on each Side. It arises from the inferior Part of the *Os Peitoris*, whence its upper Part ascends, and lower descends to its Implantations at the Bony Endings of the fourth, fifth, sixth, and sometimes seventh and eighth Ribs, near their Junction with their Cartilages. Its reputed Use by most (if not all) Anatomists, is to contract the Breast.

TRIANGULUS Septentrionalis, or *Deltozon*, the Triangle, a Northern Constellation consisting of 6 Stars.

TRIBRACHYS, is the Foot of a *Latin Verse*, consisting of three Syllables, and those all short, as *Priamus*.

TRIBRACHUS, the same with *Tribrachys*.

TRICEPS, is a Muscle of the Thigh, so called from its three Heads or Beginnings, the first and largest of which, ariseth broad and fleshy from the Inferior Edges, and External Parts of the *Os Ischium*, and *Pubis*, where they are joined to each other lying between the *Semi-tendinosus*, and *Semi-membranosus*, and that of the *Gracilis*, and descending with an Oblique Order of fleshy Fibres, is inserted partly Tendinous and Fleshy, near an Hand's Length in Breadth to the *Linea Aspera*, of the Thigh-bone, that is immediately below the Insertion of the *Quadratus Femoris*; its inferior Part making a strong round Tendon, inserted into the superior Part of the Internal and Lower *Appendix* of the Thigh-bone.

The second Head, or Beginning of this Muscle, ariseth Tendinous from the *Os Pubis*, but in its descent soon becomes Fleshy, and joins with the former, near to its Insertion to the middle Part of the *Linea Aspera* of the Thigh-bone.

The third and last Beginning of this Muscle, springeth from the inferior Part of the *Os Pubis*, between the Origination of its last described Head, and that of the *Pectineus*; and descending obliquely, joins with the First near its Insertion to the *Linea Aspera* of the Thigh-bone, immediately above the Termination of the second Head of this Muscle. This moves the Thigh variously according to the Diversity of its Beginnings; so the first described Part pulls the Thigh-bone upwards, inwards, and somewhat backwards: The second and third Beginnings of it, pull it more inwards, and turn it somewhat outwards, as when we put our Legs across each other.

TRICUSPIDES are three Valves of a Triangular Form, placed at the Mouth of the Right Ventricle of the Heart; they are made of a thin Membrane, and their Bases are fixed to the Mouth of the said Ventricle, and their Points tied by small Fibres to the Fleshy Productions; so that when the Heart contracts, its Point approaches its Basis, and the Fleshy Productions move upwards; therefore the Fibres of these Valves are relaxed, and the Valves lifted up by the Blood which gets underneath them, because the Furrows and Fleshy Productions keeping the Valves at a little Distance from the Sides of the Ventricle, give way to the Blood to pass under them, and so to thrust up the Valves, which shut so closely the Entry into the Ventricle, that the Blood cannot return the Way it came in, but when the Ventricle is dilated, the Fibres are pulled down, and the Passage made open for the Blood to enter.

TRIE, a Sea Term: See *Try*.

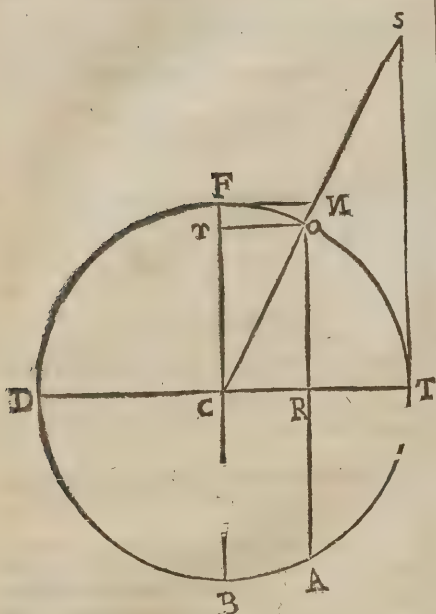
TRIEMIMERIS, is a Branch of the *Cesura* of a *Latin Verse*, when after the first Foot of the Verse there remains an odd Syllable, which helps to make the next Foot; as in this Verse.

Ille Latus Niveum molli fultus Hyacintho.

TRIGEMINUM: See *Complexus*.

TRIGILD: See *Argild*.

TRIGLYPH, in Architecture, is a Member of the Frieze of the *Doric Order*, set directly over every Pillar, and in certain Spaces in the Inter-columniations. By their Triangular Gutters (for they



Hence 'tis plain,

1. That as the Co-Sine Is to the Sine :: So is the Radius To the Tangent. That is, $CR : RO :: CS : CT : TS$.

2. As Radius Is to the Sine :: So is the Secant To the Tangent. That is, $CO : OR :: CS : ST$.

3. As the Sine Is to the Radius :: So is the Radius To the Co-Secant. That is, $OR : OC :: FC : CN$.

4. As the Tangent Is to the Radius :: So is Radius To the Co-Tangent; As $ST : TC :: FN$.

Therefore the Rectangle between the Tangent and Co-Tangent of any Ark is equal to the Square of the Radius.

11. Every Triangle has six Parts, of which three are Sides, and three Angles; and of these if we have three given, we can find the rest, (except in the Case where the three Angles only of a plain Triangle are given.)

For from thence the Sides cannot be found, because two Triangles may be Equiangular, and yet have the Sides by no means of the same length. We can find the rest, I say, if supposing the Radius divided into any Number of equal Parts, we can but discover how many of such parts any Sine, Tangent, or Secant of any Ark or Angle doth contain. Now this is ready done to our Hands, in the Table of Sines, Tangents, and Secants, which we have, with prodigious Industry, in Books ready calculated for this purpose.

12. When therefore any Triangle is given to be resolved, the first thing we have to do, is to confi-

der, That there is in the Table of Logarithms, Sines, Tangents, and Secants, a Triangle exactly similar, and equal to that which we are required to solve, and whose Sides are to one another in the very same Proportion of those of the Triangles proposed.

12. We must understand whatever *Ratio* one Side of the Triangle given, hath to the other Side about the same Angle, considered as Lengths estimated or numbered by any known Measure, as suppose Inches, Yards, Miles, Leagues, &c. the very same hath the two Sides about the same Angle in the Triangles in the Tables, or in the Tabular Parts: Which two things well understood, do lead us into the whole Mystery of Trigonometrical Calculations.

13. *Trigonometry*, is either *Plain* or *Spherical*; and both may be resolved by the means of four *Propositions*, which because of their excellent Use, are called *Axioms*.

14. The first of which relates to *Right-angle Plain Triangles*; and is this:

AXIOM I.

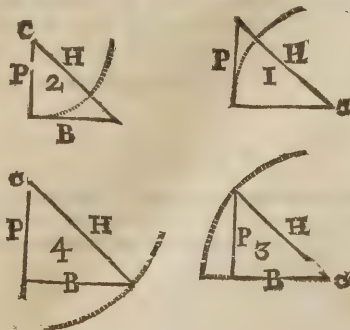
In a Right-angle Triangle, if either of the Legs be supposed to be the Radius of a Circle, the other Leg will be the Tangent of the opposite Angle, or of the Angle at the Centre; and the Hypotenuse will be the Secant of that Angle: But if you imagine the Hypotenuse to be the Radius of a Circle, then each Leg will be the Sine of its opposite Angle, or of the Angle at the Centre; as is plain from the adjoining Figures.

In the first of which, B (the Base) being made the Radius, P (the Perpendicular) is the Tangent of the Angle at a, the Centre of the Circle, which is opposite to P, and the Hypotenuse is the Secant of the same Angle.

In the second Figure, where P is made the Radius, B is the Tangent of the opposite Angle at the Centre c:

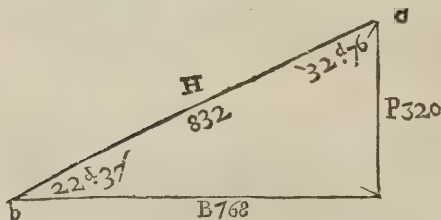
In the third Figure, where H the Hypotenuse is made the Radius, P is the right Sine of the opposite Angle at the Centre. And,

In the fourth Figure, H being also made Radius, but C the Centre of the Circle, B will be the Sine of its opposite Angle o.



The Seven Cases of Plain Triangles.

	Given	Re- qui- red.	Proportions.	Given	Re- qui- red.
1	B, a, b	P	R : B :: Tan. b : P	c : √	c
2	B, a, b	H	S, a, B :: R : H	c : √	b
3	B, H	√	H : R :: B : S, a	c : √	b : √
4	B, H	P	H : R :: B : S, a Then R : T :: b : P Or R : B :: T : b : P	which finds the √ a,	
5	B : P	√	B : R :: P : T : b	c : √	√
6	B : P	H	B : R :: P : T : b Then S : b P :: R : H	c : √	h
7	H : √	B	R : H :: S, a : B	b : √	c : √



The Calculation of the Seven Cases of Right-angle Plain Triangles.

CASE I.

Given B, a, b. Required P?

Canon $R : B :: T : b : P?$

$R = 10.$

$B = 2.8833612 = 768$

$T, b = 9.6197205 = 22^\circ 37'$

$P = 2.5050817 = 320 = P?$

The General Rule for all Operations in Trigonometry, is, to write down the Numbers found in the Tables according to the Order of the Canon: And then adding together the second and third Numbers, from their Sum subtract the First, the Remainder is the Logarithm of the Term sought.

By Gunter's Line.

Extend the Compasses from 45 Degrees on the Tangents, to 22 Degrees 37 Minutes, the same Extent will reach in the Line of Numbers from 768, backward to 320.

CASE II.

Given B, a, b. Required H?

$S, a : B :: R : H?$

$S, a = 9.9652480 = 67^\circ 23'$

$B = 2.8833612 = 768$

$R = 10.$

$H = 2.9201132 = 832 = H.$

By Gunter's Scale.

Extend the Compasses from 67 Degrees 23 Minutes to 90 Degrees on the Line of Sines; the same Extent will reach from 768, to 832 on the Line of Numbers.

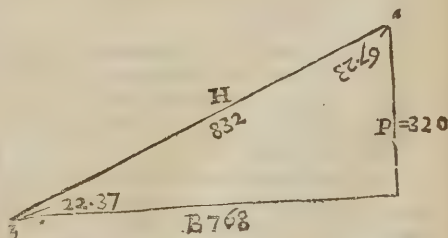
The general Method to state any Case, or to form the Canon.

1. Consider that the Thing sought must always stand in the fourth or last Place: And therefore in *Cas.* 1. since P, a Length is sought, that must be the last of the Four Terms; place it therefore last with an Interrogation-point after it, to shew that it is required or sought.

2. In the Golden-Rule the second and fourth Terms being always of the same Nature or Kind, and P being a Length sought, and B the only Length given; B is necessarily determined to be in the second Place: Write it down therefore in that Place with four Points after it thus :: to shew that the Proportion disjoins or breaks off there.

3. Consider that the Hypotenuse not being either given or sought, the first Axiom determines you to work by Tangents: And the Side given B being supposed Radius, the Proportion must be; As B consider'd as Radius, Is to its self consider'd as a Length given :: So will P consider'd as the Tangent of the Angle b, be To its self consider'd as a Length sought. That is,

$R : B :: T, b : P?$



If the Angle b had been sought, that must have been placed last, and it would have stood thus; as in *Case* the Fifth.

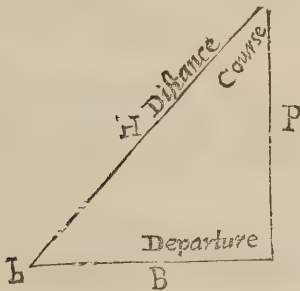
$$B : R :: P : T, b?$$

But if the Hypotenuse had been in the Question, either given or required, you must have worked by Sines, and the Hypotenuse will be always Radius; as in *Case* 2. where H is sought.

For H being required, it must stand in the last Place; and since B a Length is given of the same Nature with H , that must be in the second Place: And then say by *Axiom* 1, As B considered as the Sine of the given Angle a , Is to its self considered as a Length :: So is H considered as Radius, To its self as a Length sought: That is,

$$S, a : B :: R : H?$$

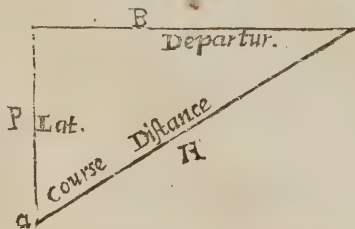
And to shew the extensive Use of this Doctrine of *Plain Trigonometry*, the General Triangle above described and numbered, may either first relate to the Sea, and then these 7 Cases will be all the Cases of *Plain Sailing*; and also of Mr. *Wright's*, or, as 'tis commonly, tho' falsely call'd, *Mercator's* too; Regard being fit had to the Way of Working by Meridional Parts, &c.



For, in this Triangle the Angle a , is the Angle of the Rhumb, or the Angle which the Line of the Ship's Course makes with the Meridian, and therefore usually by the Sailors called, *The Course*; and the Side P represents the Meridian of any Place, across which the Ship is supposed to sail; and consequently on it must be accounted the Difference of Latitude between the two Places a and b . The Angle b is the Complement of the Course, or what that Angle wants of 90 Degrees, and consequently known when the Course is so. The Base represents the Difference of Longitude, or the Departure West, or the Westing of the Ship in Comparison of the Place at a that she is supposed to have parted from: And the Hypotenuse H , represents the Distance sailed, or *run* (as the Seamen call it) or how many Leagues or Miles the Ship hath sailed from the Place a to the Place b .

This being understood, if this first Case be made a Case of *Plain Sailing*, there will be given Course and Departure; required Difference of Latitude, and the Canon is;

As Radius is to the Departure in Miles :: So is the Co-Tangent of the Course, To the Difference of Latitude in Miles.



N.B. Here the Ship being at a , is supposed to sail South Westward (or to speak exactly, W. S. W.) and therefore her Difference of Latitude is reckoned to the South, and her Departure to the West: But by inverting the same Triangle, you may suppose the Difference of Latitude North, and the Departure East; for the North is accounted to lie right before you, and consequently the East to the Right hand, and the West to the Left; wherefore the Course now is E. N. E.

2. If you would apply the Doctrine of *Trigonometry*, to the Calculation of Heights, Depths, Distances, the same Triangle and Numbers will do; regard being had to the Nature of the Terms required and sought.

For the Perpendicular P , will represent any Altitude; and B will represent a Distance from the Foot of it measured on the Ground: The Angle at b is found by the Quadrant, or some such Instrument; and consequently you may find P by *Case* 1. For,

As Radius is to the Distance, from the Foot of the Object :: So is the Tangent of the Angle of Altitude, To the Height of the Place, *i. e.*

$$R : B :: T, b : P?$$

Or, suppose the Distance B were required from above, by taking the Angle a , and finding the Length of P , by a String and Plummer. Then will

$$R : P :: T, b : P?$$

This being premised as to the general Use of *Trigonometry*, let us proceed to

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CASE III.

Given B, H. Required the Angles a, b ,

$$H : R :: B : S, a?$$

$$H = \frac{2.9201233}{10.0000000} = 832$$

$$R = 10.0000000$$

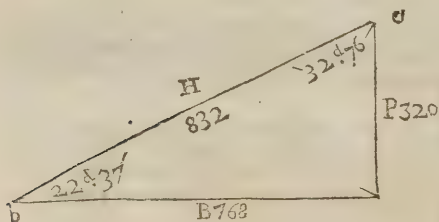
$$B = \frac{2.8853612}{9.9652379} = 768$$

$$S, a = \frac{9.9652379}{9.9652379} = 67^{\circ} 23' = \text{Angle } a$$

Which Subtracted from 90 Degrees, gives the Angle $b = 22$ Degrees, 37 Minutes.

By Gunter's Scale.

The Extent from 832, back to 768, in the Line of Numbers will reach from 90 Degrees to 67 Degrees 30 Minutes in the Line of the Sines.



CASE IV.

Given B, H. Required P?

Having found a by the foregoing Case, this will be the Theorem :

$$R : B :: T : b : P?$$

Or,

$$R : T, b :: B : P?$$

$$R = 10.$$

$$T, b = \frac{9.6197205}{2.8853612} = 22^{\circ} 37'$$

$$B = \frac{2.8853612}{2.5050817} = 768$$

$$P = \frac{2.5050817}{2.5050817} = 320.$$

By Gunter's Scale.

The Extent from 45 Degrees in the Tangent-line, back to 22 Degrees 37 Minutes, will reach in the Line of Numbers from 768, back to 320.

TRI

CASE V.

Given B, P. Required $\sqrt{a} \sqrt{b}$

$$B : R :: P : T, b?$$

$$B = \frac{2.8853612}{10.0000000} = 768$$

$$R = 10.$$

$$P = \frac{2.5051500}{9.6197888} = 320$$

$$T, b = \frac{9.6197888}{9.6197888} = 22^{\circ} 37' = b.$$

Which 22 Degrees 37 Minutes subtracted from 90 Degrees, leaves $a = 67$ Degrees 23 Minutes.

By Gunter's Scale.

The Extent from 768 back to 320, in the Line, will reach from 45 back to 22 Degrees 37 Minutes in the Tangents.

CASE VI.

Given B, P. Required H?

Having found b by the foregoing Case, this will be the Theorem :

$$S, b : P :: R : H?$$

$$S, b = \frac{9.5849685}{2.5051500} = 22^{\circ} 37'$$

$$P = \frac{2.5051500}{10.0000000} = 320$$

$$R = 10.$$

$$H = \frac{2.9201815}{2.9201815} = 832 = H?$$

By Gunter's Scale.

The Extent from 22 Degrees 37 Minutes, forwards, to 90 Degrees in the Line of Sines, will reach from 320, to 832 in the Line of Numbers.

CASE VII.

Given H and $\sqrt{a} \sqrt{b}$. Required H?

$$R : H :: S, a : B?$$

$$R = 10.$$

$$H = \frac{2.9201233}{9.9652480} = 832$$

$$S, a = \frac{9.9652480}{2.8853719} = 67^{\circ} 23'$$

$$B = \frac{2.8853719}{2.8853719} = 768 = B.$$

By Gunter's Scale.

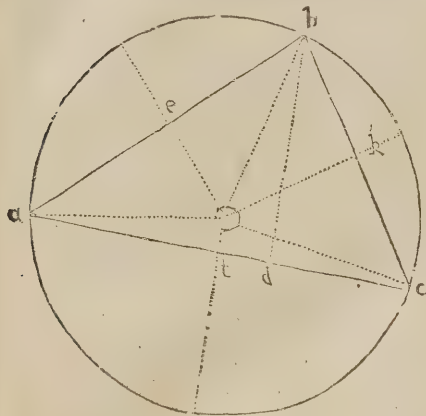
The Extent from 90 Degrees in Line of Sines back to 67 Degrees 23 Minutes, will reach in the Line of Numbers from 832 backwards to 768.

The

The Resolution of Oblique Plain Triangles.

AXIOM II.

In every Triangle, a, b, c , the Sides are in Proportion to one another, as the Sines of their opposite Angles.



Let fall from the Angle b , a Perpendicular to the Base ac : For then the whole will be resolved into 2 Right-angle Triangles, and consequently by Axiom the First $ab : R :: bd : S, a$; also $bc : R :: bd : S, c$; wherefore $ab : bc :: S, c : S, a$: by Reciprocity of Proportion.

Otherwise thus:

Draw a Circle about the Triangle, from whose Centre O , let the Perpendiculars Oe, Ok , and Ot , be let fall to the three Sides of the Triangle, and the Lines oa, ob , and oc , be drawn to the three Angles.

The Sides of the Triangle will be bisected by the Perpendiculars, and consequently ae will be $= eb, bk = kc$ and $ct = ta$; wherefore as the whole Line ab , Is to $bc ::$ So will the half Side ae be, To the half kc ; but ae and kc , are the Sines of the Angles at the Centre aoc and koc , which Angles at the Centre are severally equal to the Angles of the Triangle c and a , because they stand on half the Arcs that the Angles of the Triangle do; wherefore $ab : bc :: S, c : S, a$.

Let H, B , and O , be the Sides of an Oblique Plain Triangle; a, b and c , its three Angles; here because there is no Right-angle, three Things must be always given, that is, either two Sides and one Angle, one Side and two Angles, or else all the three Sides.

From whence will arise the three former of the six following Cases.

Given. [Requir'd.]		Proportions.
1	H. O. c	b . $O, S, c :: H : S, b$. Note, that the Angle b is ambiguous, and you must collect from the Circumstances of the Triangle, whether it be Obtuse or Acute.
2	H. O. c.	B. Here first find the Angle b by Case 1. thence a will be known by taking the Sum of $b + c$ from 180° . Then $S, c : O :: S, a : B$. Or $S, b : H :: S, a : B$.
3	c. b, O.	H. $S, c : O :: S, b : H$.
4	H. a. O	c, b. $A + O : H - O :: T \frac{1}{2} Z$ of the opposite Angles, To $T \frac{1}{2} X$ of the opposite Angles, and $\frac{1}{2} Z + \frac{1}{2} X = b$, and $\frac{1}{2} Z - \frac{1}{2} X = c$.
5	H. a, O.	B. Find the Angles by the former Case, and then $S, b : H :: S, a : B$; or $S, c : O :: S, a : b$.
6	H. O. B 3 Sides.	3 Angl. $B, H + O :: H - O : X$. And then $\frac{1}{2} B + \frac{1}{2} X = C$ and $\frac{1}{2} B - \frac{1}{2} X = Bb$. Then will $H : R :: C B : Co-sine Angle C$; and $O : R :: b B : Co-sine Angle b$; Axiom 1.

And the three last are solved by the Help of the two following Axioms.

AXIOM III.

As the Sum of the Legs about the Angle given, Is to their Difference :: So is the Tangent of half the Sum of the other two Angles, To the Tangent of half their Difference.

Now the Sum of the other two Angles is known, being what the given Angle wants of 180 Degrees, and their Difference is now found; add therefore their half Sum, and half Difference together, and it gives you the greater of the two Angles sought; and half the Difference subtracted from the half Sum, leaves the lesser Angle sought. And thus having found the Angles; if the Side opposite to the former given Angle be sought, it will be found easily by *Pardie's Axiom*, That the Sides are as the Sines of the Angles.

The Demonstration of the Third Axiom, is briefly thus.

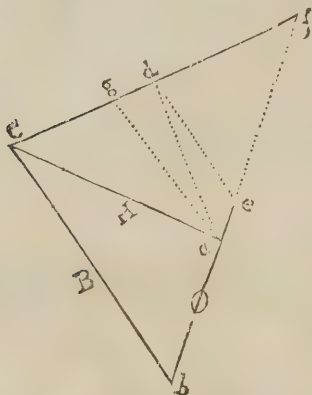
Demonstration.

I say the Sum of the Legs of any Angle a , Is to their Difference :: As the Tangent of half the Sum of their opposite Angles, Is to the Tangent of half their Difference.

Produce

Produce O , one of the given Legs of the Angle given, till $a f$ become equal to H or $C a$, and then bisect $b f$ in e , join $c f$, and bisect it also in d : Draw $a d$, which will be perpendicular to $c f$ (2. 16.) and draw $d e$, which will be parallel to $c b$. (6. 92.) Then will the Angle $c a d = d a f$; i. e. to the half of $c a f$, which external Angle $c a f = c + b$: That is, to the Sum of the opposite Angles required.

Draw then $g a$ parallel to $c b$; so will the Angle $g a c$, be equal to the alternate one c . And if from half the Sum of the opposite Angles, you take the lesser Angle; i. e. If from $c a d$, you take $g a c$, there will remain the Angle $g a d$, equal to half the Difference of the opposite Angles.



And so also, if from $b e$, half the Sum of the Legs, you take O the lesser Leg, there will remain $a e$ equal to half the Difference of the Legs. And then since the Triangle $c a d$ is Right-angled, if $a d$ be made Radius, $c d$ will be the Tangent of the Angle $c a d$; (i. e. the Tangent of half the Sum of opposite Angles;) and in the little Triangle $g a d$, $g d$ will be the Tangent of the Angle $g a d$; (i. e. the Tangent of half the Difference of opposite Angles.) But the Segments of the Legs of any Triangle cut by Lines parallel to the Base, being proportionable, $e b : e a :: c d : d g$; That is, in Words, *Half the Sum of the Legs, Is to half their Difference :: As the Tangent of half the Sum of the opposite Angle, Is to the Tangent of half their Difference*; but Wholes are as their Halves: Wherefore the Sum of the Legs, Is to their Difference :: As the Tangent of half the Sum of the opposite Angles, Is to the Tangent of half their Difference. Q. E. D.

Whence the two following Cases will easily be solved.

CASE I.

Given H , O and a . Required c, b ?

For $H + O : H - O ::$ as T , half Z opposite Angles, Is to T , half X opposite Angles; and then half $Z +$ half $X = b$, and half $Z -$ half $X = c$.

CASE II.

Given $H O$, and a . Required B ?

First find the Angles by the former Case, and then $S, b : H :: S, a : B$; or $S, c : O :: S, a : B$; by the Second Axiom.

AXIOM IV.

The Base, Is to the Sum of the Legs :: As the Difference of the Legs, Is to the Difference of the Segments of the Base made by a Perpendicular let fall from the Angle opposite to the Base.

For there is also another Case, in plain Oblique-Triangles, which requires a particular Axiom to solve it; and that is, Where all three Sides are given to find the Angles. Here let fall a Perpendicular from any Angle to its opposite Side as $a p$;



and then say, As the Side $d c$, Is to $d a + a c$, the Sum of the other two Sides :: So is the Difference of those two Sides $d a - a c$, To a fourth Number. Half of which added to half $d c$, gives you the Segment of the Base $d p$; and if subtracted from half $d c$, it will leave the other Segment $p c$. And when those Segments are thus found, the Angles are easily had thus; $d a : Radius :: d p : Co-sine$ of the Angle d , And $a c : Radius :: p c : Co-sine$ of the Angle c .

The Demonstration of which last Axiom, is thus.

Demonstration.

On the Centre a , with the Distance $a c$, describe a Circle, which will intersect both the other Sides of the Triangle, and then $x d$ will represent the Sum of the Legs $d a$ and $a c$; $d e$ will represent their Difference, and $d f$ will represent the Difference of the Segments of the Base made by the Fall of the Perpendicular $a p$.

Then I say, $d c : d x :: d e : d f$; That is, *The Base, Is to the Sum of the Legs :: As the Difference between the two Sides, Is to the Difference of Segments of the Base*; as is apparent from Prop. 67. of Pardie's Sixth Book, after drawing the prick'd Lines $e c$ and $f x$.

And then the Case will stand thus.

CASE III.

Given H, O, B , all three Sides. Required the Angles? See the Figures before.

I say, by this Axiom, $B : H + O :: H - O : X$, which expresses the Difference of the Segments of the Base, $= e f$ in the Figure.

And

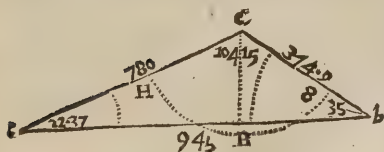
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And then having found X ; half $B + \text{half } X = dp$ the greater Segment, and half $B - \text{half } X = pc$, the lesser, by which means the two Right-angled Triangles adp , and apc , will be solved easily: For $da : \text{Radius} :: dp : \text{Co-sine of the Angle } d$; And $ac : \text{Radius} :: pc : \text{To the Co-sine of the Angle } c$.

The Operation of the Six Cases of Oblique-angled Triangles.

CASE I.

Given H, O, c . Required b ?



$$O : S, c :: H : S, b$$

The Numbers of the Triangles, are as follows

$$\begin{aligned}\sqrt{c} &= 22^\circ 37' \\ \sqrt{b} &= 53^\circ 08' \\ \sqrt{a} &= 104^\circ 15' \text{ Or, its Suppl.} = 75^\circ 45'\end{aligned}$$

$$\begin{aligned}H &= 780 \\ O &= 374.9 \\ B &= 945 \\ O &= 2.5739154 = 347.9\end{aligned}$$

$$\begin{aligned}S, c &= 9.5849685 = 22^\circ 37' \\ H &= 2.8920946 = 780\end{aligned}$$

$$\text{Sum} = 12.4770631$$

$$S, b = 9.9031477 = 53^\circ 8'$$

CASE II.

Find first the Angle b , by *Case I.* then will a be known.

Given H, O, c . Required B ?

$$S, c : O :: S, a : B$$

$$S, c = 9.5849685 = 22^\circ 37'$$

$$O = 2.5739154 = 374.9$$

$$S, a = 9.9864273 = 104^\circ 15'$$

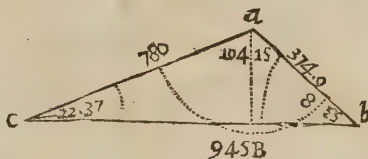
$$\text{Sum} = 12.5603427$$

$$B = 2.9753742 = 945$$

TRI

CASE III.

Given c, b, O . Required H ?



$$S, c = 9.5849685 = 22^\circ 37'$$

$$O = 2.5739154 = 374.9$$

$$S, b = 9.9031084 = 53^\circ 8'$$

$$\text{Sum} = 12.4770238$$

$$H = 2.8920553 = 780$$

CASE IV.

Given H, a, O . Required b, c ?

$$H + O : H - O :: T, \frac{1}{2} Z, \text{op.} \sqrt{\sqrt{T, \frac{1}{2} X, \text{op.} \sqrt{\sqrt{H + O}}}} : T, \frac{1}{2} X, \text{op.} \sqrt{\sqrt{H - O}}$$

$$H + O = 11540.9$$

$$H - O = 405.1$$

$$\text{Half } Z \text{ opposite Angles} = 37^\circ 52'$$

$$H + O = 3.0625820 = 1154.9$$

$$H - O = 2.6074550 = 405.1$$

$$T \text{ half } Z = 9.8907254 = 37^\circ 52'$$

$$\text{Sum} = 12.4981804$$

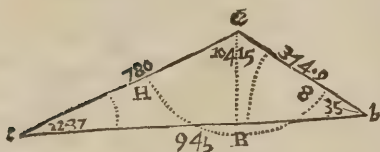
$$T, \text{ half } X. 9.4355984 = 15^\circ 15'$$

Then will half $Z + \text{half } X = 53^\circ$ Degrees 7 Minutes $= b$; And half $Z - \text{half } X = 22^\circ$ Degrees 37 Minutes $= c$.

TRI

CASE V.

Given H, a O. Required B ?



Find the Angles b and c , by Case 4, then,

$$[S, b : H :: S, a : B ?]$$

$$S, b = 9.9031084 = 53^{\circ} 8'$$

$$H = 2.8920946 = 780$$

$$S, a = 9.9864273 = 104^{\circ} 15'$$

$$\text{Sum} = 12.8785219$$

$$B = 2.9754135 = 945$$

* This is the Sine of 74.45 , the Supplement of 104.15 , to a Semi-circle.

CASE VI.

Given H, O, B. Required Three Angles ?

$$\begin{aligned} B : H + O :: H - O : X. \\ \frac{1}{2} B + \frac{1}{2} X = C B \text{ and } \frac{1}{2} B - \frac{1}{2} X = B b. \\ H : R :: B c : \Sigma c; \text{ and } O : R :: B b : \Sigma b. \end{aligned}$$

$$B = 2.9754318 = 945$$

$$H + O = 3.0622058 = 1154.9$$

$$H - O = 2.6074540 = 405.1$$

$$\frac{1}{2} B = 472 \frac{1}{2} \quad 5.6696058 =$$

$$\frac{1}{2} X = 247 \frac{1}{2} \quad 2.6942280 = 495$$

$$H = 2.8920453 = 780'$$

$$\frac{1}{2} B + \frac{1}{2} X = 750$$

$$\frac{1}{2} X - \frac{1}{2} B = 225 \quad R = 10.$$

$$B C = 2.8573225 = 720$$

$$\Sigma c = 9.9652672 = 23^{\circ} 37'$$

$$O = 2.5739154$$

$$R = 10.$$

$$B b = 2.3521825$$

$$\Sigma b = 9.7782671 = 53^{\circ} 08'$$

And when thus the Nature, Reason, and Method of Operation in the Calculating of the Sides and Angles of Oblique Triangles, is fully under-

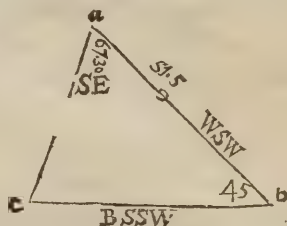
TRI

stood; its Application, Use, and Practice, will be very easie and plain, tho' its Extent be very large and ample. For,

First, If you have a Mind to apply it to what they call *Oblique Sailing*, or the Doctrine of *Oblique Plain Trigonometry*, applied to *Sailing*; your former Triangle and Cases will reach all that you can desire.

As suppose a Ship Coasting along by the Shore from the Place b , lets an Head Land by her Compaſs, (as c) and finds it to bear from her S. S. W. then she fails on, W. S. W. 51. 5 Miles or Minutes to a ; and then finds that the Head Land bears from her full S. E.

'Tis required to determine her Distance from this Head Land when she was at b , and now she is at a .



First, To Plot the Triangle.

Draw a streight Line, as B, representing the first bearing of the Head Land, which was S. S. W. Then from 6 Points take 2, and there remains 4 = 45°; because the Ship sailed West South West, make the Angle b equal to 45°, and so will the Line O represent the Distance sailed, and b will be the Course. Prick off the Distance run, viz. 51. 5 Miles from b to a . Then because the Ship sailed W. S. W. the contrary Rhumb from a to b , must be E. N. E. And since the South-East Rhumb makes with that an Angle of $67^{\circ} 30'$, you must make the Angle at a , just $67^{\circ} 30'$. So with the Line H, when drawn, intersect the Line B in the Point of the Situation of the Head Land c ; and by that means will the Triangle be completed.

This being done, if you please, (tho' Plotting the Triangle is not of absolute Necessity, but very useful and instructive) then consider, that it must be a Case of *Oblique Plain Triangles*, where is given the Angle a and b , and the Side O. Required H and B ?

To find H, say, (because c is also known if a and b are)

$$[S, c : O :: S, b : H ?]$$

Operation.

Operation.

$$\begin{aligned} S, c &= 9.9656153 = 67^{\circ} 30' \\ O &= 1.7118072 = 51.5 \text{ Miles.} \\ S, b &= 9.8494850 = 45^{\circ}. \\ \text{Sum} &= 11.5612922 \\ H &= 1.5956769 = 39.4 \text{ Miles.} \end{aligned}$$

And to find B, you may say,

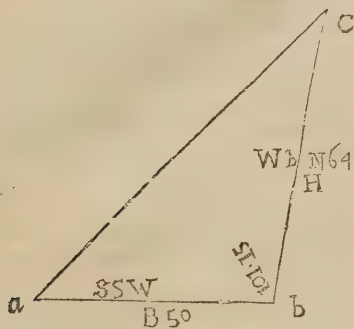
$$\text{As } S, b : H :: S, a : B?$$

Or,

$$\text{As } S, c : O :: S, a : B?$$

I shall give but one Instance more in this Matter, which is this.

Suppose a Ship sail S. S. W. 50 Leagues, and then W. by N. 64 Leagues : What was her direct Course, and what is her Distance from the Place she went from ?



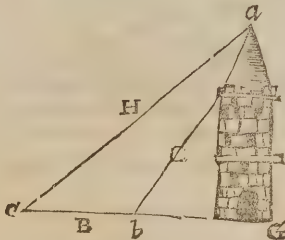
To Plot the Cafe.

Let b be the Place from whence the Ship sailed, and let B represent the S. S. W. Rhumb, and the Distance thereon run = 50 Leagues, from b to a .

Then, since the first Course was two Points, and the Second seven Points from the Meridian, make an obtuse Angle at b , equal to 9 Points, $101^{\circ} 15'$: And on the Leg H. set 64 Leagues, then drawing the Side $a c$, the Triangle will be formed.

In which you have two Legs, H and B forming the Angle a , and that Angle given. And this is *Cafe 4. of Plain Oblique Triangles.*

Secondly, If you would apply this Part of Trigonometry to the Measuring of inaccessible Distances, Heights, &c. at Land; the Practice will be very easie.



Suppose a Tower, Steeple, &c. as $a G$, whose Height you would take, but can measure no nearer than from c to b , but know the Length B, is = 100 Yards.

Here you can take the Angle $a b G$, with your Quadrant, and consequently the Obtuse Contiguous one, $c b a$, is known.

The Angle c is known after the same way by the Instrument : Wherefore having in the Obtuse Angled Triangle $H O B$, the Base B, and the Angles c and b , you must find O by *Cafe 3. of Oblique Plain Triangles* : For since c and b are known their Sum subtracted from 180, will leave $c a b$, known. Therefore say,

$$\boxed{\text{As } S, a : B :: S, c : O?}$$

And when it is thus known or found, having in the Right-angled Triangle, $b a, G$, the Hypotenuse O, and the Angle b .

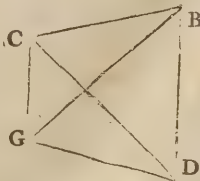
By *Cafe* the 7th of Right-angled Triangles.

$$\text{As } R : O :: S, b : a G?$$

The Altitude of the Tower sought.

Thirdly, Suppose an inaccessible Distance, as B D, which imagine to be the Distance between two Forts, Bastions, &c. on the Wall or Line of an Enemies City or Camp; and that because of the Cannon, &c. you can go no nearer than the Line G C, but can measure from G to C, and at each Station take Angles with an Instrument.

Having taken then by the Theodolite, &c. the Angles G C D, and C G D, and measured G C : And also having taken the Angles C G D, and B C G. This premised, which is easily done by the Instrument.



You have in the Triangle C B G, the Side C G, and the two Angles G, and G C B : Wherefore, also the Angle C B G. Say therefore,

$$\text{As, } B : G C :: S, C : G B ?$$

And consequently $G B$ is found.

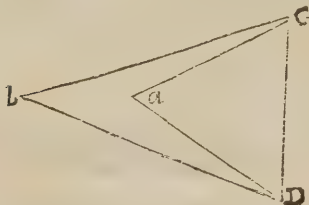
Again, in the Triangle CDG , the Angles GCD , CGD , and the Side CG being given, the Side, GD , will be found by this Proportion.

$$\text{As } S, D : CG :: S, C : GD ?$$

And consequently GD also is found.

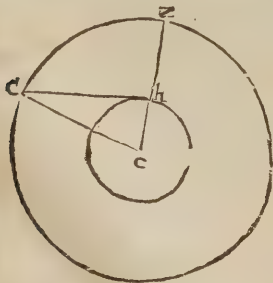
And now having in the Triangle GBD , the two Sides GB and GD , and the included Angle G ; you can first find the remaining Angles severally by *Axiom 3*, and then the Side BD by *Axiom 2*.

Or, If not being able to get nearer than the Point a , you could not measure sideways as before, but only backward to b , or forward from b to a : You may then easily gain the Length from D to C .



For placing the Instrument at a , you can take the two Angles baD and baC , and take also CaD ; measure then from a to b , and at b take also the two Angles abD , and abC . Then can you easily gain the Sides aC , and aD , in the two Triangles baC , and baD ; and having before taken by the Instrument the Angle CaD , you may find the Side CD in that last Triangle aCD , by the second and third *Axioms* of *Plain Oblique Trigonometry*. Also,

Fourthly, On the Application of this Part of *Trigonometry*, to the Doctrine of *Astronomy*, depends the Method for finding the Parallax and Distance of a Planet, or Star.



Let c be the Centre of our Earth, and b a Point on its Surface; at which, an Observer at b takes with an Instrument the Angle $\angle bz$, or the Distance of the Meridian Moon C , from her Zenith at z .

Her true Distance from the Zenith, is known by the Astronomical Tables; which is the Angle $\angle cz$: But the observed Angle $\angle bz$, being external to the Triangle, $\angle bz$, will be \equiv to $\angle + c$.

Where take c from it, and the Remainder is the Angle $b \angle c \equiv$ to the Moon's Parallax, whose Subtense is $bc \equiv$ to the Earth's Semidiameter.

Suppose that bc be 4000 Miles; then in the Triangle $\angle bc$, there are all the Angles, and the Side bc known.

Wherefore,

$$\text{As } S, \angle : bc :: S, b : \angle c ?$$

Which is the Moon's Distance from the Centre of our Globe.

And also, as

$$S, \angle : bc :: S, c : \angle b ?$$

The Moon's Distance from the Place of Observation.

TRIGONOMETRY Spherical.

Definition 1.

A *Spherical Triangle* is made by, or contained under the Arks of three great Circles of the Sphere.

Definition 2.

A *Spherical Angle*, is the mutual Inclination or Aperture of the Planes of two great Circles.

Properties of Spherick Triangles.

1. When one Circumference of a Circle cuts, crosses, or falls on another, the Sum of the Angle made thereby is equal to two right ones.
2. When two Circumferences of Circles cross each other, tho' opposite or vertical Angles are always equal.
3. In every *Spherical Triangle*, the greater Angle is opposite to the greater Side.
4. An *Isoceles Spherical Triangle*, hath its Angles at the Base equal to each other; the *Converse* of which also is true, That if the Angles at the Base are equal, the Triangle is an *Isoceles*.
5. If two *Spherical Triangles* are mutually *Equilateral*, they are also *Equiangular* and *Similar* one to another.
6. If two *Spherick Triangles* have in each one Angle and two Sides including it; or if they have one Side and two Angles adjacent respectively equal, the whole Triangles are equal.
7. Any two Sides of a *Spherick Triangle*, are longer than the Third; because the Ark of a great Circle is the nearest Distance between any two Points on the Sphere.

8. All

8. All great Circles must cut each other into two equal Parts, because their common Intersection is a Diameter of the Sphere; and consequently, the two Points of Intersection are at the Distance of a Semicircle from each other.

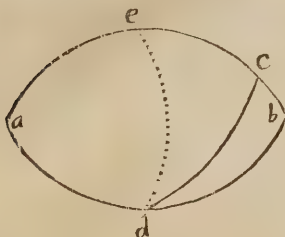
COROLLARY.

Hence 'tis plain, That every Side of a Spherick Triangle must be less than a Semicircle.

9. The opposite Angles at the Intersection of two Circles are always equal, because the same Planes constitute both Angles; that is, the Angle a is equal to the Angle b : See Figure below.

10. In a Spherical Triangle, if the Sum of the Legs of any Angle be greater, equal, or less than a Semicircle; the internal Angle at the Base is accordingly greater, equal, or less than the outward and opposite one; and consequently, the Sum of the two internal Angles at the Base is greater, equal or less than two Right Angles.

DEMONSTRATION.



If $ac + cd$ be greater than ab , dc must be longer than cb , and consequently, the Angle b ($= a$) will be bigger than the Angle cdb . Property 3. But if $ac + cd$ be equal to a Semicircle, then dc will be equal to cb , and the Angle $b =$ Angle cdb . And in the Triangle $dc b$, because $dc + cd$ is less than ab ; therefore ac is greater than cd , and consequently the external Angle adc is greater than the Angle a ; that is, than the Angle b , the internal Angle at the Base.

Also, since the Angle $adc +$ the Angle $cdb =$ two Right Angles, therefore the Angle $adc +$ the Angle a is great than two Right Angles, &c.

11. In an Isosceles Sph. Triangle, if one of the equal Legs is greater, equal, or less than a Quadrant, the Angle is accordingly greater, equal, or less than a Right one.

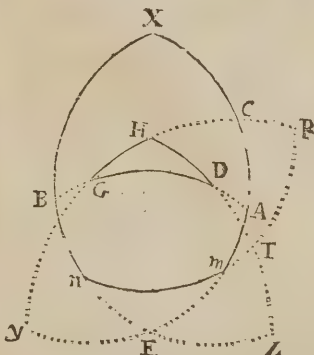
12. The Sum of the three Sides of every Sph. Triangle, is less than a Circle.

For cd is less than $cb + bd$, wherefore $ac + dc + da$, must be less than the Sides $acb + adb$: See the Figure above.

13. The Measure of any Spherick Angle, is an Ark of a great Circle described from the Angular Point, and precisely 90 Deg. distant from it; that is, making the Angular Point the Pole of that Circle.

14. The Poles of the Sides of any Triangle GHD, do on the Surface of the Globe, constitute another Triangle nxm , which may be called Supplemental to the Triangle GHD; for the Supplements of the Angles and Sides of the Triangle nxm , are equal to the Sides and Angles of the Triangle GDH.

DEMONSTRATION.



From the Points GHD, as Poles describe three great Circles $x Ay$, $RT mn$, $x B n z$, then is $ym =$ Quadrant $= Ax$; because m is the Pole of $HG y$, and x or E the Pole of GA , therefore $mx = Ay =$ Supplement of $CA =$ Angle HGD , and zn is Quadrant $= Bx$, therefore $nx = Bx =$ Supplement of Angle GHD , and $nt =$ Quadrant $= mR$, therefore $nm = TR =$ Supplement of the Angle DHG .

Note, That the Triangle nEm constituted between the three next Poles, has its three Sides and Angles equal to the Angles and Sides of the Triangle GHD, save that the greatest Side nm is the Supplement of the greatest Angle H , and the Angle E the Supplement of the Side GD .

15. Any Angle of a Triangle, with the Difference of the other two, is less than two Right Angles. For, xn is less than $xm + mn$:

That is,

$$2 \angle - D < 2 \angle - G + 2 \angle - H.$$

Therefore,

$$G + H - D < 2 \angle.$$

For since $2 \angle - D < 2 \angle - G + 2 \angle - H$:

That is,

$$2 \angle - D < 4 \angle - G - H,$$

By transferring D, G , and H , 'twill be $2 \angle + G + H < 4 \angle + D$; then by taking away $2 \angle$ from both Sides, and transferring D , you'll have $G + H - D < 2 \angle$. Q. E. D.

16. If two Triangles are mutually Equiangular, they are also mutually Equilateral; for because they are Equiangular, their Supplemental Triangles are Equilateral, (by 14th) and therefore Equiangular (by 15th) and therefore the proposed Triangles are Equilateral (by 14th.)

17. First, The 3 Angles of every Triangle are greater than 2 Right Angles, and less than 6 Right ones.

For $nx + mx + mn < 4L$ (by 12.)

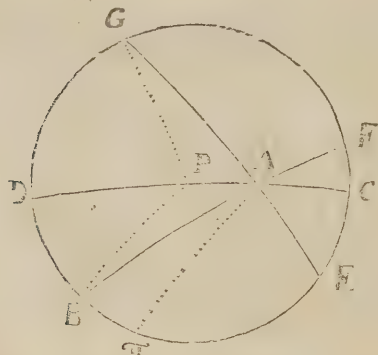
That is,

$$6L - D - G - H < 4L; \\ i.e. 2L < D + G + H.$$

2dly, The Sum of the internal Angles, is less than the Sum of the Internal and External, both which, in all, make but six Right Angles.

18. Of several Arks of great Circles falling from the same Point of the Sphere's Surface on another Circle, the greatest is that which passes through the Pole of the Circle, and the next to this, is greater than that which is farther off.

For suppose P the Pole of the Circle $C \odot D$, and \odot the Pole of DPC ; then is $AD > AB > AE > AC$; and the Arch $B \odot C > BP > BD$.



19. A great Circle passing through the Poles of another great Circle, cuts it at Right-angles; and on the contrary, if it cuts it at Right-angles, it passes through its Poles. Thus the Angle $PBD = L = PGD = PDB$, also $= \odot AC$.

20. In an oblique angled Triangle, if the Angles at the Base are like, or of the same kind, i.e. both Acute, or both Obtuse; the Perpendicular falls within the Triangle, and the Quadrantal Ark without: But if they be unlike, the Perpendicular falls without, and the Quadrant within. For the Triangle EAF has the Angles E and F Acute, and the Perpendicular AC falls within, and the Quadrant $A \odot$ without. Also the Triangle BAG hath B and G obtuse; and the Perpendicular AD within, and the Quadrant $A \odot$ without: But the Triangle BAE has the Angle B, E of different kinds, and the Perpendicular AC without, and the Quadrant $A \odot$ within.

Also, by the same Figure is manifest, how the Ambiguities of Right-angled Triangles may be solved, viz.

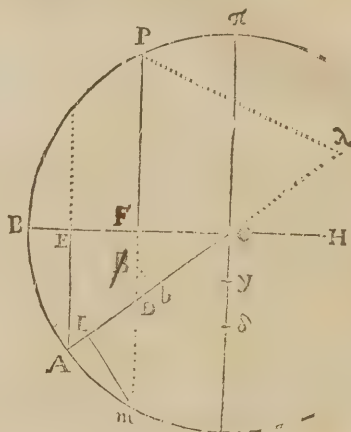
SOLUTIONS.

1. The Legs of the Right-angle are of the same kind with the opposite Angles. So in the Triangle BDA , because DA is greater than a Quadrant DP , the Angle DBA is greater than the Right-angle DBP : And in the Triangle BCA , because AC is less than the Quadrant PC , the Angle CBA is less than the Right-angle CBP .

2. If the Legs (and consequently the Angles) are of the same or different kinds; the Hypotenuse is accordingly less or greater than a Quadrant: So in the Triangles EDA , ECA , the Hypotenuse EA is less than a Quadrant; but in the Triangle BDA , the Hypotenuse AB , is greater than the Quadrant BP .

3. If the Hypotenuse is less or greater than a Quadrant, either Leg, with its adjacent Angle, is accordingly of the same or different kind, as follows from the two last.

For the viewing the Sines, Co-sines, and other Right-Lines of Arks, which are not visible in a common Sphere; Let the Arks of three great Circles of Card Paste-board be put together, as in an Armillar Sphere.



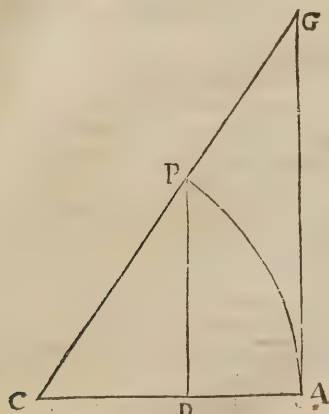
As suppose the two Arks BP , BA , and that BPH , the Plane of the greater Ark were turn'd round BH , till that a Right-Line falling from P perpendicular to the Plane BAH , may fall on the same Point of the Line CA , suppose on D ; for in that Position PAB will be a Spherick Triangle Right-angled at A , and BP the Hypotenuse, BA the Base, PA the perpendicular Arch.

And suppose PA (in the next Figure) be equal PA of the Triangle, and fitted according to its Letters therein, and draw AE , PF Perpendicular to BC ; so AE , PE , PD , will be Sines of the Arks BA , BP , PA , and their Co-sines will be EC , FC , DC .

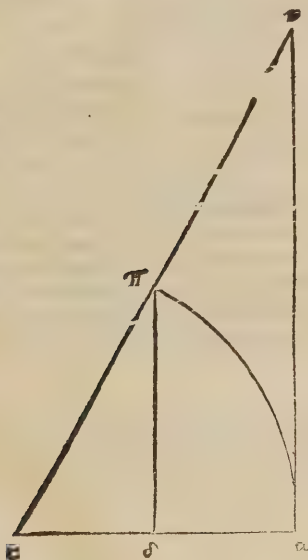
These

TRI

These things being done and conceived, the two first Axioms of *Spherick Trigonometry* will presently appear, and also the Demonstration of the 16 Cases of Right-angled Triangles, without any other Figure or Production of Sides, as is usual.



To that End, let the Ark $\propto \alpha$ (Fig. 3.) be also fitted in the Solid, according to its Letters; (*as you will find it very well done in Mr. Heynes's Trigonom.*) Then in the two Right-angled Spherick Triangles. PBA, $\propto \beta \alpha$, having the same Acute Angle B, at the Base.



TRI

AXIOM I.

The Sines of the Hypothenuses are proportional to the Sines of the Prependiculars.

P F : P D :: $\text{C} : \text{C} \sharp$.

AXIOM II.

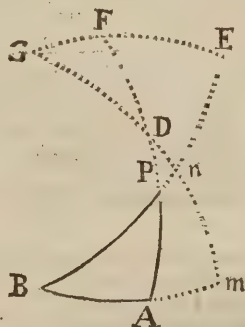
The Sines of the Bases are proportional to the Tangents of the Perpendiculars.

$$AE:AG::\alpha C,\alpha\gamma.$$

For the two Right-angled Triangles FPD , $C\pi\delta$, are similar; as also EAG , and $C\alpha\gamma$.

And for the Solution of the following Cases, I suppose BAP (in this Figure) a Right-angled Triangle, and its Sides produced to Quadrants BN, BM, AD.

Suppose also, P E, P F, N G, and E G, Quadrants. Then is N E equal to B P, and the Complement of B A equal to A M, equal to *b* A D M, and F E equal to Angle F P E, equal to Angle B P A, and G D equal to N M, equal to Angle B, and the Angles at A, M, N, E, and F, right.



N. B. The Reason of producing the Sides of the Triangle B A P to Quadrants, is, because by this Means the Angles may be turned into Sides, and the Hypothenuses into Sides and Perpendiculars & *contra*: And from hence it comes to pass, that the Parts of the Triangle given, do sometimes fall in Co-fines and Co-Tangents, instead of Sines and Tangents.

Here follow the Proportions for Right-angled Triangles.

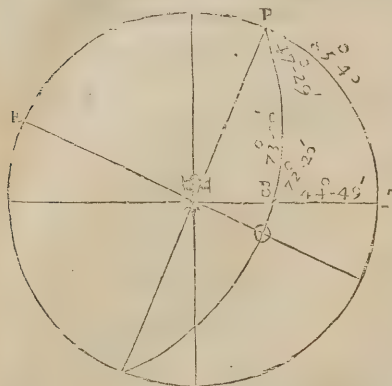
The Propositions for the Solution of the Sixteen Cases of Right-angled Spherick Triangles, with their Solutions of the Ambiguities.

Given.	Req.			Given.	Req.
1	BA, PA	BP	S, DA: R. S, AM:: S, DP: S, PN (by Ax. 1.)	i. e. R: cs: BA:: cs, PA: cs, BP. (Sol. 2.)	c c b.
2	BA, PA	B	S, BA: S, BM:: T, PA: T, MN (by Ax. 2.)	i. e. S, BA: R:: T, PA: T, B. (Sol. 1.)	c c L.
3	BP, P	B	S, PE: S, PN:: T, FE: T, DN (by Ax. 2.)	i. e. R: cs, BP:: T, P: cs, B. (Sol. 1.)	b L. L.
4	BP, P	BA	S, GE: S, GF:: T, EN: T, FD	i. e. R: cs, P:: T, PB: T, PA. (Sol. 3.)	b L. L adj.
5	BP, P	BA	R: S, BP:: S, P: S, BA (by Ax. 1.) Sol. 1.		b L. c op.
6	PA, P	BP	S, GF: S, GE:: T, DF: T, NE	i. e. cs, P: R:: r, PA: r, BP. (Sol. 5.)	L adj. b.
7	PA, P	B	S, PF: S, PD:: S, FE: S, DN	i. e. R: cs, PA:: S, P: cs, B. (Sol. 1.)	c. L adj. L.
8	BA, B	PA	S, BM: S, BA:: T, MN: T, PA	i. e. R: S, BA:: T, B: T, PA. (Sol. 1.)	c. L adj. c.
9	PA, B	BA	T, MN: S, BM:: T, PA: S, BA	i. e. T, B: R:: T, PA: S, BA. (Ax. 2.) Ambig.	c. L op. c.
10	PA, B	BP	S, B: R:: S, PA: S, BP (Ax. 1.) Ambiguous.		c. L op. b.
11	PA, B	P	S, PD: S, PF:: S, DN: S, FE	i. e. cs, PA: R:: cs, B: S, P. Ambiguous	c. L op. L.
12	PA, BP	P	T, NE: S, EG:: T, FD: S, FG	i. e. T, BP: R:: T, PA: cs, P. (Sol. 3.)	c. b. L adj.
13	PA, BP	B	S, BP: S, BN:: S, PA: S, NM	i. e. S, BP: R:: S, PA: S, B. (Sol. 1.)	c. b. L op.
14	PA, BP	BA	cs, PA: R:: cs, BP: cs, BA. (Sol. 2.)		c. b. c.
15	B, P	BP	T, FE: S, EP:: T, DN: S, PN	i. e. r, P: R:: cs, B: cs, BP.	L L b.
16	B, P	PA	S, FE: S, FP:: S, DN: S, DP	i. e. S, P: R:: cs, B: cs, PA. (Sol. 1.)	L L c.

N. B. If you Project the given Triangle within a Primitive Circle, according to the Doctrine of the Sphere, as was shewed under Spherick Geometry, all Ambiguities will vanish; and if the Triangle be Oblique, the Perpendicular will be drawn also: And this is a very good Way to gain a clear Notion of Spherical Trigonometry; which cannot be understood thoroughly, without the Doctrine of the Sphere, and its several Projections be first learn'd.

Examples,

Examples of the Sixteen Cases of Right-angled Spherical Triangles.



For the Sun's Declination.

C A S E I.

Given the Complement of the Sun's Amplitude B A, and the Latitude P A: Required the Sun's Distance from the Pole P B, which is the Complement of his Declination?

$$R : \Sigma BA :: \Sigma PA : \Sigma BP?$$

$$R. = 10.0000000$$

$$\Sigma BA = 9.8508702 = 44^\circ 49'$$

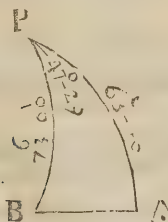
$$\Sigma PA = 9.6149441 = 65^\circ 40'$$

$$\Sigma PB = 9.4658143 = 73$$

Wherefore the Sun's Declination is 77 Degrees, = \odot B.

C A S E II.

Given as before B A and P A. Required B, the Angle of the Sun's Position?



$$S, BA : R :: T, PA : T, BP?$$

$$S, BA = 9.8480909$$

$$\text{Radius} = 10.$$

$$T, PA = 10.3446523$$

$$T, B = 10.4965614 = 72^\circ 20'$$

C A S E III.

Given B P, equal to the Sun's Distance from the Pole, and P the Sun's Hour from Midnight. Required B, the Angle of the Sun's Position?

$$R : \text{Cof. } BP :: T, P : \epsilon, B?$$

$$\text{Radius} = 10.$$

$$\Sigma BP = 9.4659353$$

$$T, P = 10.0376939$$

$$\epsilon, B = 72^\circ 20' = 9.5036292$$

C A S E IV.

For the Latitude.

Given B P equal to the Sun's Distance from the Pole, and P the Hour from Midnight. Required P A the Latitude?

$$R : \Sigma P :: T, BP : T, PA?$$

$$\text{Radius} = 10.$$

$$\Sigma P = 9.8298212$$

$$T, BP = 10.5146610$$

$$T, PA = 10.3444822 = 65^\circ 40'$$

C A S E V.

For the Sun's Amplitude.

Given as before B P and P. Required B A, equal to the Sun's Amplitude?

$$R : S, BP :: S, P : S, BA?$$

$$\text{Radius} = 10.$$

$$S, BP = 9.9805963$$

$$S, P = 9.8675151$$

$$S, BA = 9.8481114 = \text{Co-Amplitude}$$

Wherefore, the Sun's Amplitude will be $45^\circ 11'$.

C A S E VI.

For the Sun's Declination.

Given P A equal to the Latitude, and P the Hour from Midnight. Required B P equal to the Distance from the Pole, or the Sun's Co-Declination?

$$\Sigma B : R :: T, PA : T, BP?$$

$$\Sigma P = 9.8298212$$

$$\text{Radius} = 10.$$

$$T, PA = 10.3446523$$

$$T, BP = 10.5148311 = 73^\circ$$

C A S E VII.

For the Angle of the Sun's Position.

Given as before PA, and P. Required B?

$$R. \Sigma PA :: S, P :: \Sigma, B?$$

$$R. = 10.$$

$$\Sigma PA = 9.6149441$$

$$S, P = 9.8675151$$

$$\Sigma B = 9.4824592 = 72^{\circ} 20'$$

C A S E VIII.

For the Latitude.

Given BA equal to the Sun's Amplitude, B equal to the Sun's Position. Required PA the Latitude?

$$R : S, BA :: T, B : T, PA?$$

$$\text{Radius} = 10.$$

$$S, BA = 9.8480909$$

$$T, B = 10.4968908$$

$$T, PA = 10.3449817 = 65^{\circ} 40'$$

C A S E IX.

Given PA equal to the Latitude, and B the Angle of Position. Required BA equal to the Amplitude?

$$T, B : R :: T, PA : S, BA?$$

$$T, B = 10.4968908$$

$$\text{Radius} = 10.$$

$$T, PA = 10.3446523$$

$$S, BA = 9.8477615 = 40^{\circ} 49'$$

C A S E X.

For the Sun's Distance from the Pole.

Given PA and B, as before. Required BP, the Sun's Distance from the Pole?

$$S, B : R :: S, PA : S, BP?$$

$$S, B = 9.9790192$$

$$\text{Radius} = 10.$$

$$S, PA = 9.9595964$$

$$S, BP = 73^{\circ} 0' = 9.9805772 = \text{Co-Decl.}$$

Wherefore the Declination is 17 Degrees.

C A S E XI.

For the Hour from Midnight.

Given, as before, PA and B. Required P, the Hour from Midnight?

$$\Sigma PP : R :: \Sigma B : SP?$$

$$\Sigma PA = 9.6149441$$

$$\text{Radius} = 10.$$

$$\Sigma B = 9.4821283$$

$$S, P = 9.8671842 = 47^{\circ} 29'$$

C A S E XII.

For the Hour.

Given PA, equal to the Latitude BP, equal to the Sun's Amplitude. Required P = Sun's Hour from Midnight?

$$T, BP : R :: T, PA : \Sigma P?$$

$$T, BP = 10.5146610$$

$$\text{Radius} = 10.$$

$$T, PA = 10.3446523$$

$$\Sigma P = 9.8299913 = 47^{\circ} 21'$$

The Hour from Midnight $47^{\circ} 29' = 3 \text{ H. } 10'.$

C A S E XIII.

For the Angle of Position.

Given, as before, PA : PB. Required B, and the Angle of the Sun's Position?

$$S, BP : R :: S, PA : S, B?$$

$$S, BP = 9.9805963$$

$$\text{Radius} = 10.$$

$$S, PA = 9.9595964$$

$$S, B = 9.9790001 = 72^{\circ} 20'$$

C A S E XIV.

Given Latitude and Declination. Required the Sun's Amplitude?

Given, as before, PA and P B. Required BA = Sun's Amplitude?

$$PA : R :: \Sigma BP : \Sigma BA.$$

$$\Sigma PA = 9.6149441$$

$$\text{Radius} = 10.$$

$$\Sigma BP = 9.4659353$$

$$\Sigma BA = 9.8509912 = 44^{\circ} 49'$$

Equal to the Co-Amplitude, wherefore the Sun's Amplitude = $45^{\circ} 11'.$

C A S E

CASE XV.

Given B the Angle of the Sun's Position, and P the Hour from Midnight. Required B P the Sun's Distance from the Pole?

$$T, P : R :: \angle B : \angle B P ?$$

$$T, P = 10.0376939$$

$$\text{Radius} = 10.$$

$$\angle B = 9.5031092$$

$$\angle B P = 9.4654053 = 73^\circ$$

CASE XVI.

Given as before B, the Angle of Position, and P the Hour from Midnight. Required P A the Latitude of any Place?

$$S, P : R :: \angle B : \angle P A ?$$

$$S, P = 9.8675151$$

$$\text{Radius} 10.$$

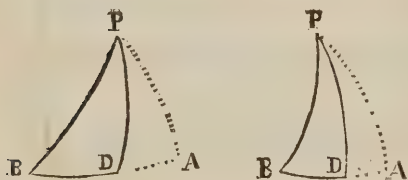
$$\angle B = 9.4821283 = 72^\circ 20'$$

$$\angle P A = 9.6146132 = 24^\circ 19'$$

Oblique Spherical Triangles, may be reduced to two Right-angled Spherical ones, by letting fall a Perpendicular, which either divides the Oblique Triangle proposed into two Right ones, or makes two Right ones, by adding a Right-angle Triangle to it.

In *Oblique Triangles* there are 12 Cases, 10 of which (by this Preparation) may be solved by the two first *Axioms*, or by Rules deduced from them.

RULE I.



The Co-sines of the Angles at the Base, are proportional to the Sines of the Angles at the Vertex. For by Case 7. of *Right-angled Spherical Triangles*.

$$R : \cos PA :: \sin BPA : \cos BP ?$$

$$R : \cos PA :: \sin DPA :: \cos DP ?$$

$$\text{Therefore } \cos B : \sin BPA :: \cos D : \sin DPA ?$$

RULE II.

The Co-sine of the Sides are proportional to the Co-sines of the Bases. For by Case 1. of *Right-angled Spherical Triangles*.

$$R : \cos PA :: \cos BA : \cos BP ?$$

$$R : \cos PA :: \cos CA : \cos DP ?$$

$$\text{Therefore } \cos BA : \cos BP :: \cos DA : \cos DP ?$$

RULE III.

The Sines of the Bases are reciprocally proportional to the Tangents of the Angles at the Bases. For by *Axiom 2*.

$$S, BA : R :: T, PA : T, BP ?$$

$$S, DA : R :: T, PA : T, DP ?$$

$$\text{Therefore } S, BA \times T, B = R \times T, A = S, DA \times T, D ?$$

$$\text{Consequently } S, BA : S, DA :: T, D : T, B ?$$

RULE IV.

The Tangent of the Sides, are reciprocally proportional to the Co-sines of the Angles at the Vertex. For by Case 4.

$$T, BP : R :: T, PA : \cos DPA ?$$

$$T, DP : R :: T, PA : \cos DPA ?$$

$$\text{Therefore } T, BP : T, DP :: \cos DPA : \cos BPA ?$$

AXIOM III.

In any Triangle the Sines of the Sides are proportional to the Sines of the opposite Angles. For by *Axiom 1*.

$$S, BP : R :: S, PA : S, B ?$$

$$S, DP : R :: S, PA : S, D ?$$

$$\text{Therefore } S, BP : S, DP :: S, D : S, B ?$$

In letting fall your Perpendicular, observe this Rule.

Let it fall from the End of a given Side, and opposite to a given Angle.

For by so doing, you have enough given in one of the Right-angled Triangles to determine any of its unknown Parts.

The two first Cases are solved each by one Operation by the third Axiom; the other eight Cases are solved each by two Operations.

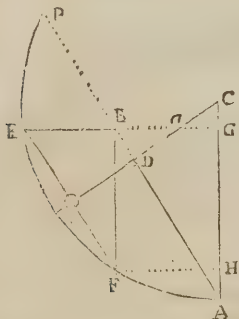
Observe also, the Addition or Subtraction both of the Segments of the Base, and Angles at the Vertex, according as the Perpendicular falls within or without the Triangle.

Proportions for the Solving the first Ten Cases of Oblique Spherick Triangles.

Cafe.	Given.	Req.	Proportion.
1	BP, PD, B.	D.	$S, PD : S, B :: S, BP : S, D$. <i>Ambiguous.</i>
2	B P, E, D.	PD.	$S, D : S, BP : S, B : S, PD$. <i>Ambiguous.</i>
3	B P, P D B.	BD	$R : cs, B :: T, BP : T, BA$, by <i>Cafe 4th</i> of Right-angled Spherick Triangles. Then $cs, BP : cs, BA :: cs, DP : cs, DA$, by <i>Rule 2d</i> . Then $BA \pm DA = BD$, according as the Perpendicular falls within or without the Triangles; which is doubtful, unless the Kind of the Angle D is known.
4	B P, P D, B.	P.	$R : cs, BP :: TB : ct, BPA$, by <i>Cafe 3d</i> . And then, $T, DP : T, BP :: cs, BPA : cs, DPA$, by <i>Rule 4th</i> . Then $BPA \pm DPA = PBD$. Here also, the falling of PA is doubtful, unless you know the Kind of the Angle D.
5	B P, B, D.	P.	$cs, BP : R :: ct, B : T, BPA$, by <i>Cafe 3d</i> . Then, $cs, B : S, BPA :: cs, D : S, DPA$, by <i>Rule 1</i> . then, if B and D are $\begin{cases} \text{alike} \\ \text{unlike} \end{cases}$ $BA \pm DPA = BD$.
6	B P, B, D.	BD	$cs, B : R :: ct, BP : ct, BA$, by <i>Cafe 4th</i> . Then $T, D : T, B :: S, BA : S, DA$, by <i>Rule 3d</i> . And then, if B and D are $\begin{cases} \text{alike} \\ \text{unlike} \end{cases}$ $BPA \pm DA = BPD$.
7	B, P, B P.	D.	$cs, BP : R :: ct, B : T, BPA$, by <i>Cafe 3d</i> . Then $s, BPA : s, DPA :: cs, B : cs, D$, by <i>Rule 1</i> . If $BPA > BPD$, and B $\begin{cases} \text{acute} \\ \text{obtuse} \end{cases}$, D is $\begin{cases} \text{obtuse} \\ \text{acute} \end{cases}$. But if $BPA > BPD$, and B $\begin{cases} \text{acute} \\ \text{obtuse} \end{cases}$, D is $\begin{cases} \text{acute} \\ \text{obtuse} \end{cases}$.
8	B, P, B P.	D P.	$cs, BP : R :: ct, B : T, BPA$, by <i>Cafe 3d</i> . Then $cs, DPA : cs, BPA :: T, BP : DP$, by <i>Rule 4th</i> . Then, if DPA is $\begin{cases} \text{like to} \\ \text{unlike} \end{cases}$ B, DP is $\begin{cases} < \\ > \end{cases}$ than a Quadrant.
9	B P, B D, B.	DP.	$cs, B : R :: T, BP : T, BA$, by <i>Cafe 4th</i> . Then $cs, BA : cs, BP :: cs, DA : cs, DP$, by <i>Rule 2d</i> . Then, if DA is $\begin{cases} \text{like} \\ \text{unlike} \end{cases}$ (PA) $> B, BD$ is $\begin{cases} < \\ > \end{cases}$ than a Quadrant.
10	B P, B D, B.	D.	$cs, B : R :: T, BP : T, BA$, by <i>Cafe 4th</i> . Then $S, DA : S, BA :: T, B : T, D$, by <i>Rule 3d</i> . Then if BA is $\begin{cases} < \\ > \end{cases}$ BD, D is $\begin{cases} \text{like} \\ \text{unlike} \end{cases}$ B.

LEMMA.

The Difference of the versed Sines of two Arks multiplied by half the Radius, is equal to the Sine of half the Sum of those Arks multiplied by the Sine of half the Difference of the Arks.



Suppose, AF, AB , the two Arks; the Difference of the versed Sines is $AG - AH = GH = BF$, and the Sine of half the Sum of the Arks is AD , for $EP = FA$, the Sine of half the Difference of the Arks is FO . Now the Triangles ACD, EFB , are Similar, (for the Triangles ACG, EOA are Similar, therefore the Angle C equal to the Angle E) therefore, as $AC : AD :: FE : FB$, or $\frac{1}{2} AC : AD :: \frac{1}{2} FE (i. e. FO) : FB$; therefore $\frac{1}{2} AC \times FB = FO \times AD$. For since $AC : AD :: FE : FB$; therefore $AC \times FB = AD \times FE$; and consequently $\frac{1}{2} AC \times FB = \frac{1}{2} AD \times FE$: that is $= AD \times \frac{1}{2} EF = AD \times OF$. $Q. E. D.$

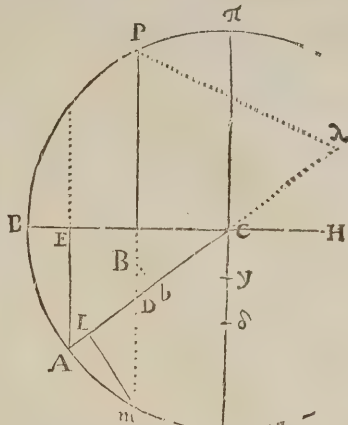
AXIOM IV.

The Rectangle, or Product of the Sines of the Legs, Is to the Square of the Radius :: As the Difference of the versed Sines of the Base, and of the Difference of the Legs, To the versed Sine of the Vertical Angle.

Demonstration.

Resume the foreaid Circles of Pastboard, and suppose there B the Angle required, BA, BP , (equal BM) its Legs, PA the Base to be any way oblique to the Plane BA , and not perpendicular as before. Then will BPA be an oblique Triangle.

Let fall PB perpendicular to Bm , and $\pi\gamma$ perpendicular to $C\alpha$, and Bb to bA , and mL perpendicular to cA ; therefore Bb is perpendicular to cA , and bL equal $bA - LA$ equal to the versed Sine of the Base, less the versed Sine of the Difference of the Legs.



But $AE : AC :: bL : Bm$

And $mF : a c :: Bm : \gamma a$.

Therefore multiplying the Correspondent Terms of both Proportions,

$$AE \times mF : AC \times a c :: (bL \times Bm : Bm \times \gamma a) \\ bL : \gamma a.$$

CASE XI.

The Three Sides of any Spherick Triangle being given, to find an Angle.

The Rectangle of the Sines of the Legs, Is to the Square of the Radius :: As the Sine of $\frac{1}{2}$ Base more $\frac{1}{2}$ diff. of the Legs multiplied by the Sine of $\frac{1}{2}$ Base less $\frac{1}{2}$ diff. of the Legs, Is to the Square of the Sine of $\frac{1}{2}$ the Angle required.

Demonstration.

$AE \times mF : Rq ::$ (by Ax. 4. $bL : \gamma a$) $bL \times \frac{1}{2} R : \gamma R \times \frac{1}{2} R$; (i. e. by the foregoing Lemma, and the first in Mr. Caswell's Trigonometry.)

$AE \times mF : Rq :: S, \frac{1}{2} \text{Base} \times \frac{1}{2} \text{diff. } cr \times S, \frac{1}{2} \text{Base} - \frac{1}{2} \text{diff. } cr \text{ to } Sq \frac{1}{2} \text{Angle.}$

Example in Numbers.

Suppose BP equal $60^\circ. 10'$, DP equal $46^\circ. 42'$, BD equal $87^\circ. 30'$ were given, and the Angle P required?

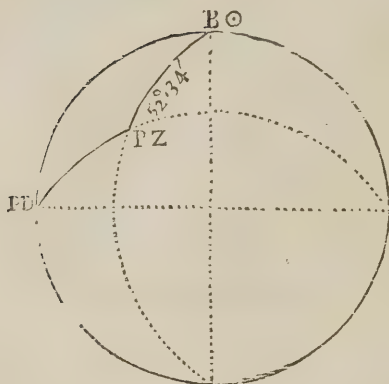
$\frac{1}{2}$ the Base is	$43^\circ. 45'$
$\frac{1}{2}$ the Diff. of the Sides is	$6. 44$
$\frac{1}{2}$ the Base $+$ $\frac{1}{2}$ Diff. of the Sides is	$50. 29$
$\frac{1}{2}$ the Base $-$ $\frac{1}{2}$ Diff. of the Sides is	$37. 01$
Rad. Sq.	20.0000000
$S, \frac{1}{2} \text{Base} + \frac{1}{2} \text{diff. } cr \times S, \frac{1}{2} \text{Base} - \frac{1}{2} \text{diff.}$	19.6669325

Sum	39.6669325
Subtract the \square of the Sine of the Legs	19.8002534

Remainder $= Sq.$ of the Sine of $\frac{1}{2} < P$ 19.8666791
 The $\frac{1}{2}$ of which is the Sine of $59^\circ. 03'$ 9.9333395
 That is $\frac{1}{2}$ the Angle required.
 Therefore being doubled is $118^\circ. 06' = P.$

If these Data's were projected by the Directions given in *Spherical Geometry*; the Angles may be likewise found, without Calculation, and 'twill stand thus. The Triangle will be $\odot Z D$, where

$$\begin{aligned} Z &= P \\ P &= D \\ \odot &= B \\ BD &= \odot P \\ PD &= Z P \\ PB &= Z \odot \end{aligned}$$



CASE XII.

The three Angles being given, to find a Side.

The Angles adjacent to the Side requir'd, call Legs; and the Angle opposite, call Base: Then work as in the 11th Case.

For, such is the Operation in the Supplemental Triangle, whose Angles and Sides are equal to the Supplements of the Sides and Angles of the Triangle propos'd: But Arks and their Supplements, have the same Sines and Tangents.

Example in Numbers.

In the Triangle B D P, there is given the

$$\text{Angle} \begin{cases} P = 143.0, \text{ the Sun's Azimuth from the North.} \\ B = 15.04, \text{ the Angle of the Sun's Position.} \\ D = 30.00, \text{ the Hour from Noon.} \end{cases}$$

Required the Side P D, which is the Complement of the Latitude?

$$\begin{aligned} \text{Com. Angle } P &= 37^{\circ} 00' \} \text{ Ar. co. of } \S 0.220537 \\ \text{Angle } D &= 30^{\circ} 00' \} \text{ the Sines. } \S 0.301030 \\ \text{Angle } B &= 15^{\circ} 04' \} \text{ Angle op.} \end{aligned}$$

$$\begin{aligned} \text{Sum} &= 82^{\circ} 04' \\ \frac{1}{2} \text{ Sum} &= 41^{\circ} 02' \\ \frac{1}{2} \text{ Sum} - \text{Angle op. } 25^{\circ} 58' \} \text{ Sines } \S 9.817233 \\ & \qquad \qquad \qquad \S 9.641323 \end{aligned}$$

$$\text{The Sum of the 4 Logarithms equal } 19.980113$$

$$\text{Its half is the Co-sine of } 12^{\circ} 13' \quad 9.990056$$

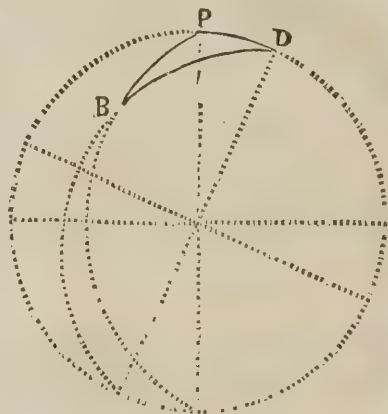
Which doubled, gives $24^{\circ} 26'$ equal P D equal Complement of Latitude: Wherefore the Latitude must be $65^{\circ}.34'$.

In a Spherick Triangle, that is Right-angled or Quadrantal, the two Parts which are adjacent to the Right-angle or Quadrant, together with the Complements of the other three, are called, by my Lord Napier, *The Five Circular Parts*. And if the three Parts which enter the Question, (viz. 2 given, and 1 required) have no Interruption, (now tho' a Right-angle or Quadrant come between, 'tis not counted an Interruption) that Part which is between the other two, is called *The middle Part*, and then the other two are called *Extreams adjacent*, or *conjunct*. But if there be an Interruption, that Part which is separated from the other two, is called *The middle Part*, and the other two, are *Extreams opposite*, or *disjunct*. This being premised, Napier, after a diligent View of the Solutions of all the Cases of Right-angled and Quadrantal Triangles, has observed, That they all agree in one or two Propositions, viz. That the Radius multiplied by the Sine of the middle Part, is equal to the Rectangle or Product made of the Tangents of the Extreams conjunct, or to the Rectangle of the Co-sines of the Extreams disjunct.

This Proposition was invented by the Lord Napier, purely for Ease of Memory, and has been applied in all its Cases by most Authors; as particularly, by Sir Isaac Newton, Norwood, Sir J. Moor, Ward, &c.

Some more Examples of Oblique Spherick Triangles in Numbers.

In the Oblique Triangle B P D, (See the Figure following.)



Suppose there be given the Sides.

$$PD = 24^{\circ}.20', \text{ } \left\{ \begin{array}{l} \text{the Complement of the Sun's} \\ \text{Latitude.} \end{array} \right.$$

$$BD = 73^{\circ}.00', \text{ } \left\{ \begin{array}{l} \text{the Complement of the Sun's De-} \\ \text{clination, or his Distance from} \\ \text{the North Pole.} \end{array} \right.$$

$$PB = 52^{\circ}.34', \text{ } \left\{ \begin{array}{l} \text{the Complement of the Sun's} \\ \text{Altitude.} \end{array} \right.$$

'Tis required to find the Angle.

$$BPD, \left\{ \begin{array}{l} \text{the Sun's Azimuth from the North Part of} \\ \text{the Meridian.} \end{array} \right.$$

$\frac{1}{2}$ the

the Base is 36° 30'
 the Diff. of the Side is 14 07
 the Base + $\frac{1}{2}$ the Diff. of the Sides is $\left\{ \begin{array}{l} 50 \\ 22 \end{array} \right. 37$
 23

The Radius Square. 24 000000
 $S, \frac{1}{2}$ Base + $\frac{1}{2}$ Diff. cr $\times S, \frac{1}{2}$ base - $\left\{ \begin{array}{l} 19 \\ 469525 \end{array} \right.$

Sum 39 469525
 From which Subtr. the \square of the $\left\{ \begin{array}{l} 19 \\ 514701 \end{array} \right.$
 Sines of the Legs.

Rem. = Sq. of the Sine of $\frac{1}{2}$ the Angle P. 19 954824
 Its $\frac{1}{2}$ is the Sine of 71° 40' = $\frac{1}{2}$ the Angle required $\left\{ \begin{array}{l} 9 \\ 977412 \end{array} \right.$

Therefore being doubled, is 143° 20' = Angle P.

For practical Operations in this Case, nothing is more easy and expeditious than the following Method, of which I shall give two useful Examples: One for the *Azimuth*, as above; the other for the *Hour of the Day*.

1. In the Triangle DPB, let the same things be given, and the Angle P, or *Azimuth* requir'd.

PD = 24° 20' $\left\{ \begin{array}{l} \text{Ar. co. of the} \\ \text{Sines,} \end{array} \right. \left\{ \begin{array}{l} 0 \\ 385056 \end{array} \right.$
 BP = 52 04 $\left\{ \begin{array}{l} 0 \\ 103146 \end{array} \right.$
 BD = 73 00 = Base.

Sum = 149 54.

Sum = 74 57 $\left\{ \begin{array}{l} \text{their Sines} \end{array} \right. \left\{ \begin{array}{l} 8 \\ 984842 \end{array} \right.$
 $\frac{1}{2}$ S - Base = 1 57 $\left\{ \begin{array}{l} 9 \\ 531822 \end{array} \right.$

Sum = 19 001872
 Its half is the Co-sine of 71° 32' 9 500936

Which being doublet, gives 143° 04' for the Angle P, or the *Azimuth* from the North.

2. In the Triangle DPB, the Sides being given, and the Angle D, which is the Hour from Noon requir'd.

PD = 24° 20' $\left\{ \begin{array}{l} \text{Ar. co. of} \\ \text{the Sines} \end{array} \right. \left\{ \begin{array}{l} 0 \\ 385056 \end{array} \right.$
 BD = 73 00 $\left\{ \begin{array}{l} 0 \\ 019404 \end{array} \right.$
 BP = 52 34 Base.

Sum = 149 55

$\frac{1}{2}$ Sum = 74 57 $\left\{ \begin{array}{l} \text{their Sines} \end{array} \right. \left\{ \begin{array}{l} 9 \\ 984842 \end{array} \right.$
 $\frac{1}{2}$ Sum - Base = 22 23 $\left\{ \begin{array}{l} 9 \\ 580698 \end{array} \right.$

The Sum of the four Logarithms = 19 970000

Its half is the Co-sine of 14° 58' 9 985000

Which doubled, is 29° 56' = Angle D; and being reduced into Time, gives 1 Hour and above 59 Minutes from Noon, which was requir'd.

TRILATERAL, in Geometry, is the same with a three-sided Figure.

TRIMM of a Ship, is her best Posture, Proportion of Ballast, and hanging of her Masts, &c. for sailing; and therefore, to find the best way of making any Ship to sail swiftly, is called finding her *Trimm*. And this depends very much on Experience and Judgment, and several Trials and Observations which the Commander may make Aboard.

TRINE, is an Aspect of the Planets, when at the Distance of 120 Degrees or 4 Signs from each other, and noted thus Δ .

TRINGLE, in Architecture, is a little Member fix'd exactly upon every *Triplyb*, under the Plar-band of the Architrave, from whence hang down the *Gutts* or Pendant-Drops in the *Doric* Order.

TRINOMIAL-Root, in Mathematicks, is a Root consisting of three Parts connected together by the Sign +; as $a + b + c$: See *Binomial*.

TRIP: The Seamen say a Ship goes with her *Top sails a-Trip*, when she carries them hoisted up to the highest, and when the Wind blows not too hard, but a gentle, or *Loom-gale*.

TRIPARTITION, is Division by 3, or a taking the third Part of any Number or Quantity.

TRIPPLICATE Ratio, must be well distinguish'd from *Triple*, and is the Ratio of Cubes one to another.

Thus in these Geometrical Proportionals 2, 4, 8, 16, 32, as the Ratio of the first Term (2) is to the third (8) Duplicate of the first to the second, or as 4 the Square of 2, to 16 the Square of 4; so the Ratio of 2 to 16 the fourth Term, is *TriPLICATE*; or as 8 which is the Cube of 2, to 64 the Cube of 4. And this *TriPLICATE Ratio* is compounded of all the preceding Ratio's.

TRIPPING; a Term in Heraldry: See *Passant*.

TRIPTOTES, in Grammar, are such defective Nouns as have but three Cases, as *Sordem, Sordis, Sorde*, and *Tantundem*. &c.

TRIS-DIAPASON, or *Triple-diapason*, a Chord in Musick, otherwise called a Triple, Eighth, or Fifteenth.

TRISE; the Sea Word for hailing up any thing by a dead Rope, or one that doth not run in a Block, but 'tis done by Hand or by main Strength: Thus if any Cask, Chest, or other Goods hath only a Rope fastned to it, and so without a Tackle is pulled up into the Ship by Hand, they say it is *Trised up*.

TRISMUS, is the grinding of the Teeth, or a Convulsion of the Muscles of the Temples, whereby the Teeth gnash whether one will or no. *Blanchard*.

TRISYLLABLE, is a Word consisting of but three Syllables.

TRITÆOPHYES, is an Ague that comes every third Day. *Blanchard*.

TRITEUS, is the same with *Febris Tertiana intermittens*. *Blanchard*.

TRITONE, a Term in Musick, which signifies a greater Fourth.

TRITURATION, is a pounding in a Mortar, &c. whereby Medicines are reduced to Powder, that they may be the better mixed.

TROCANTER, the same that *Rotator*.

TROCHILE, in Architecture, is that hollow Ring or Cavity which runs round a Column next to the *Tore*; vulgarly 'tis call'd the *Casement*: 'Tis frequently bordered or rather shut in with *Lists*. 'Tis often called *Scotia*, from its shady dark Appearance.

TROCHISCI, *Trochisks*, are round or other figur'd Medicinal things, made of Powders, mix'd with viscus Extracts, and made up into Paste, and then into round, triangular, &c. little Bodies, which are to be dried up in the Shade. They are much the same with Tablets and Lozenges.

TROCHLEA, a Term in Anatomy, the same with *Bathmū*.

TROCHLEA

TROCHLEA, is also one of the Mechanick Powers, and is what we usually call the *Pulley*.

TROCHLEARIS, is the upper or greater oblique Muscle of the Eye: See *Obliquus Superior*.

TROCHOID, the same with *Cycloid*; which see.

TROCHOLICKS, is by some taken for that Part of the Mechanicks which shews the Properties of all circular Motions.

TROMA, is a Wound from an external Cause.

TROMBOSIS, is a Trembling, or a Depravation of the voluntary Motion of the Members.

Blanchard.

TROPEs, are, when Words are changed from their proper Signification, and applied to other things than what they naturally mean.

TROPICAL Year: See *Year*.

TROPHY, in Architecture, is an Ornament which represents the Trunk of a Tree charged or encompassed all round about with Arms or Military Weapons, both *Offensive* and *Defensive*.

TROPICKS, are Circles supposed to be drawn parallel to the *Equinoctial* at $23^{\circ} 30'$ distance from it, one towards the North, called the *Tropick of Cancer*; and the other towards the South, call'd the *Tropick of Capricorn*, because they lie under these Signs.

Mr. *Halley*, in *Philos. Trans.* N^o 215, by three subsequent Observations made near the Tropick at proper Intervals of Time, shews a Method to find the Moment of the Sun's Ingress into the Tropical Signs, capable of all the Exactness the most Accurate can desire; and that without any Consideration of the Parallax of the Sun, of the Refractions of the Air, of the greatest Obliquity of the Ecliptick, or Latitude of the Place, premising the following *Lemma*, viz.

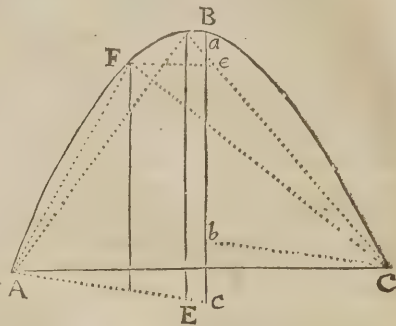
1. That the Motion of the Sun in the Ecliptick, about the time of the Tropicks, is so nearly equal, that the Difference from Equality is not sensible, from five Days before the Tropicks, to five Days after; and the Difference arising from the little Inequality that there is, never amounts to above $\frac{1}{4}$ of a single Second in the Declination, and this by reason of the Nearness of the *Apogæon* of the Sun to the *Tropick of Cancer*.

2. That for five Degrees before and after the Tropicks, the Differences whereby the Sun falls short of the Tropicks, are as the versed Sines of the Sun's Distance in Longitude from the Tropicks; which versed Sines in Arches under five Degrees, are beyond the utmost Nicety of Sense, as the Squares of those Arches. From these two follows,

3. That for five Days before and after the Tropicks, the Declination of the Sun falls short of the utmost Tropical Declination, by Spaces which are in duplicate Proportion, or as the Squares of the Times by which the Sun is wanting of, or past the Moment of the Tropick.

Hence 'tis evident, that if the Shadows of the Sun, either in the Meridian, or any other Azimuth, be carefully observed about the time of the Tropick, the Spaces whereby the Tropical Shade falls short of, or exceeds those at other times, are always proportionable to the Squares of the Intervals of Time between those Observations and the true time of the Tropick; and consequently, if the

Line, on which the Limits of the Shade is taken, be made the Axis, and the correspondent Times from the Tropick, expounded by Lines, be erected on their respective Points in the Axis as Ordinates, the Extremities of those Lines shall touch the Curve of a Parabola, as in the following Figure, where a, b, c, e , being supposed Points observed, the Lines aB, bC, cA, eF , are respectively proportional to the times of each Observation, before or after the Tropical Moment in *Cancer*.



This being premised, the true time of the Tropick by three Observations, is found from this Geometrical Problem.

Having three Points in a Parabola, A, B, C , or A, F, C , given, together with the Direction of the Axis, To find the Distance of those Points from the Axis.

Of this there are two Cases; the one when the time of the second Observation B is precisely in the Middle-time between A and C : In this case, putting t for the whole time between A and C , then A or the Interval of the remotest Observation A from the Tropick is found by the following Analogy:

$$2ac - bc : 2ac - \frac{1}{2}bc :: \frac{1}{2}t \text{ (or } AE) : A$$

the time of the remotest Observation A from the Tropick.

But the other Case, when the middle Observation is not exactly in the Middle between the other two times, as at F , is something more operose, and the whole Time from A to C being put $= t$, and from A to $F = S$, $ce = c$, and $bc = b$, the

Theorem will stand thus $\frac{t^2 c - b S S}{2 t c - 2 b S} = A$, the

Time sought.

To illustrate this Method of Calculation, he gives the two following Examples.

Anno 1500, Bernard Walther, in the Month of June, at Nuremberg, observed the Chord of the Distance of the Sun from the Zenith, by a large Parallacltick Instrument of *Ptolemy*, as follows.

$$\text{June } \left\{ \begin{array}{l} 2. 45467 \\ 9. 44934 \\ 16. 44990 \end{array} \right\} \text{ and June } \left\{ \begin{array}{l} 8. 44975 \\ 12. 44883 \\ 16. 44990 \end{array} \right.$$

In both which Cases, the middle Time is exactly in the Middle between the Extremes, and therefore in the former three, $ac = 533$, $bc = 477$ and t , the Time between being 14 Days; by the first Rule, the Time of the Tropick will be found by this Proportion.

As

As 589 : 827 $\frac{1}{2}$:: $\frac{1}{2}$ t (or 7 Days) : 9 d. 2 h. 2'. Whence the Tropick Anno 1500, is concluded to have fallen June 11 d. 20 h. 2'.

In the latter three, a equal 107, b equal 15, and the whole Interval of Time is 8 Days equal t ; whence,

As 199 : 206 $\frac{1}{2}$:: 4 Days : 4 d. 3 h. 37', which taken from the 16 Day at Noon, leaves 11 d. 20 h. 23' for the Time of the Tropick agreeing with the former to the third Part of an Hour.

Anno 1636, Gassendus at Marseilles observed the Summer Solstice by a Gnomon of 55 Foot high, in order to determine the Proportion of the Gnomon to the Solstitial Shade; and he left these Observations, serving for the second Rule.

June 19 } { 31766 }
 June 20 } Shadow { 31753 } Parts whereof the
 June 21 } (Sh. N. { 31751 } Gnomon was 89428.
 June 21 } { 31759 }

These being divided into two Sets of three Observations each, viz. The 19th, 20th, and 22d; and the 19th, 21st, and 22d, there will be in the first three, c equal 13, b equal 7, t equal 3 Days, S equal 1; and in the second, c equal 15, b equal 7, t equal 3, and S equal 2. Whence, according to the Rule, the 19th Day at Noon, the Sun wanted of the Tropick a Time proportionate to one Day, as t to c — S S b to 2 c —2 b S ; that is, as 110 to 64 in the first Set, or 107 to 62 in the second Set, that is, 1 d. 17 h. 15' in the first, or 1 d. 17 h. 25' in the second Set; whence it may be concluded, that the Moment of the Tropick was on June 10 d. 17 h. 20' in the Meridian of Marseilles.

The great Advantage of this Method is, That any very high Buildings serves for an Instrument, or the top of a high Tower or Steeple, or even any high Wall whatsoever, that may be sufficient to intercept the Sun, and cast a true Shade. Nor is the Position of the Plane on which you take the Shade, or that of the Line thereon, on which you measure the Recels of the Sun from the Tropick, very material; but in what way soever you discover it, the said Recels will be always in the same Proportion, by reason of the smallness of the Angle, which is not 6 Minutes in the first five Days: Nor need you enquire the Height or Distance of your Building, provided it be very great, so as to make the Spaces you measure, large and fair. But it is convenient, that the Plane on which you take the Shade, be not far from perpendicular to the Sun, at least not very oblique; and that the Wall which casts the Shade, be strait and smooth at top, and its Direction nearly East and West. And it will be requisite to take the Extream greatest or least Deviation of the Shadow of the Wall, because the Shade continues for a good time at a stand without Alteration, which will give the Observer leisure to be assured of what he does, and not be surprized by the quick transient Motion of the Shade of a single Point at such a Distance.

The principal Objection is, That the Penumbra or Parrile Shade of the Sun, is in its Extreame very difficult to distinguish from the true Shade, which will render this Observation hard to determine nicely.

But if the Sun be transmitted through a Telescope, after the manner used to take his Species in a Solar Eclipse, and the upper half of the Object-glass be cut off by a Paper pasted thereon, and the exact

upper Limb of the Sun be seen just emerging out of, or rather contiguing the Species of the Wall, (the Position of the Telescope being regulated by a fine Hair extended in the Focus of the Eye-glass) then by this Means the Limit of the Shade may be obtained to the utmost Exactness.

TROVER, in Law, is an Action which a Man hath against one, that having found any of his Goods, refuses to deliver them upon Demand. Of late, Actions of Detinue are much turn'd into Actions upon the Case, *Sur Trover & Conversion*.

TROUGH of the Sea, is the Hollow or Cavity made between any two Waves or Billows in a rowling Sea; and when a Ship lies down there, they say, *She lies in the Trough of the Sea*.

TRUCKS, belonging to the Carriage of a Piece of Ordnance, are the Wheels which are on the Axletree to move the Piece.

TRUE Conjunction: See *Conjunction True*.

TRUE Place of a Planet or Star, is a Point of the Heavens shewn by a right Line drawn from the Centre of the Earth through the Centre of the Planet or Star; whereas its apparent Place, is that which is found by a right Line drawn from the Observer's Eye through the Centre of the Planet or Star. And this Point in the Heavens is referred to the Ecliptick or Zodiack, by the Planet or Star's Circle of Longitude.

TRUNCATED Pyramid or Cone, is one whose Top is cut off by a Plane parallel to its Base; and therefore the Figure of the truncated Top must always be similar to the Base.

How to find its Solidity, see in the Word *Frustrum*.

A Truncated Cone, or the *Frustrum* of that Body, is called sometimes a *Curri-Cone*.

TRUNK Roots of a Plant, are little Roots which break or grow out of the Trunks of Plants; and are of two kinds.

1st, Such as Vegetate by a direct Descent, the Place of their Eruption being sometimes all along the Trunk, as in *Mints*, &c. and sometimes only in the utmost Point, as in *Brambles*.

2^{dly}, Such as neither ascend nor descend, but shoot forth at Right-angles with the Trunk; which therefore, tho' as to their Office they are true Roots, yet as to their Nature they are a middle Thing between a Trunk and a Root. Dr. Grew *Anat. of Plants*, p. 27.

TRUNNIONS of a Piece of Ordnance, are those Nobs or Bunches of the Guns Metal which bear her up upon the Cheeks of the Carriages.

TRUSSES, are Ropes fastned to the Parrels of a Yard in a Ship, serving either to bind fast the Yards to the Masts, when the Ship rowls, lying either a *Hull*, or an Anchor; or to hale down the Yards in a Storm or Gust of Wind: They belong to the Main-yard, Fore-yard, and Miffen, and are all brought to upon occasion.

TRY; a Ship is said to Try, when she hath no more Sails abroad but her Main-sail: When her Tacks are close aboard, the *Bowlings* set up, and the *Sheets* haled close aft; when also the Helm is tied close down to the Board, and so she is let lie in the Sea. And sometimes when it blows so hard, that they cannot maintain the Main-sail, as they say; that is, cannot bear it out, they make her lie a Try under a *Miffen-sail* only.

TUBÆ Fallopiane, are two slender Passages, proceeding from the Womb, which when they are a little removed from it, grow gradually wider : They have large Holes or Orifices, which almost lie shut, the extream Edges falling flat ; yet if they be diligently opened and dilated, they represent the extream Orifice of a Trumpet. Their Use is to receive the Eggs from the Testicles, and carry them into the Womb, according to the Excellent *R. de Graef* ; the Truth whereof is evident from the Inspection of Rabbits dissected.

TUBER, properly, is a subterraneous Mushroom, or a *Truffle* ; but by Botanick Writers, is often used to signify the round turgid Roots of some Plants : Which therefore they call *Turberefe Roots*, or *Knobby Roots*, as *Mr. Ray* Englishes it.

TUBEROUS : See *Tuber*.

TUBULI Lactiferi, certain Lactiferous or Milk-carrying Pipes, which are as it were the Store-house wherein the Milk is kept, and thro' which, as by Conduits, it flows to the Nipples of the Breasts of Females when they give Suck.

TUBULI Vermiculares, are certain small winding Cavities formed on the outsides of the Shells of Marine Shell-Fishes, in which some small Worms inhabit and breed.

These are very frequently found on such *Fossil Shells* as are dug up almost every where out of the Earth ; and therefore help to demonstrate, that they are real Shells, and not *formed Stones*, as some will have it.

TUCK of a Ship, is the trussing or gathering up of her Quarter under Water ; which if she lie deep, makes her have a Broad, or as they call it, *Fat Quarter*, and hinders her Steering, by keeping the Water from passing swiftly to her Rudder ; and if this Trussing lie too high above the Water, she will want bearing for her Works behind, unless her Quarter be very well laid out.

TUMOR ; by this Word, which in general signifies any Swelling, the Chirurgeons understand a *Disease* or morbid Affection, incident most usually to the Organical Parts of the Body, increasing their Quantity preternaturally by Means of some superfluous Humours coming thither from other Parts.

TUNICLE, in Anatomy, signifies a Membranous Coat.

TUNNAGE : See *Tonnage*.

TURBITH Mineral, or Yellow Precipitate of Mercury, is thus made. Put any Quantity of good Quicksilver into a Glass Retort, and pour on it four times its Weight of Oil of Vitriol. Set the Retort in Sand, and when the Mercury is dissolv'd, which 'twill hardly be in ten Hours time, distil off the Humidity gently at first, but make a strong Fire at last, to drive out all the Spirits. When you break the Retort, you will find in it a white Mass, which powder in a Glass Mortar, and then pouring warm Water upon it, it will presently turn *Yellow* ; it must be washed several times, and dried in the Shade, and then 'twill Vomit and Purge strongly.

TURIONES ; amongst Botanick Writers, are the first young tender Shoots or Tops which any Plants do annually put forth of the Ground.

TURN, a Term belonging to the Movement of a Watch, and signifies the entire Revolution of any Wheel or Pinion.

The number of *Turns*, which the *Pinion* hath in one *Turn* of the *Wheel*, is commonly set down as a

Quotient in common Arithmetick, thus, 5) 60 (12 where the *Pinion* 5 playing in a *Wheel* of 60, moveth round 12 times in one *Turn* of the *Wheel*.

Now, by knowing the Number of *Turns*, which any *Pinion* hath in one *Turn* of the *Wheel* it worketh in, you may also find how many *Turns* a *Wheel* or *Pinion* hath, at a greater Distance : as the *Contrate-wheel*, *Crown-wheel*, &c.

For, 'tis but Multiplying together the *Quotients*, and the Number produced, is the Number of *Turns*, as in this Example.

$$\begin{array}{r} 5) 55 (11 \\ 5) 45 (9 \\ 5) 40 (8 \end{array}$$

The first of these three Numbers hath 11 *Turns*, the next 9, and the last 8. If you multiply 11 by 9, it produceth 99 ; that is, in one *Turn* of the *Wheel* 55, there are 99 *Turns* of the second *Pinion* 5, or the *Wheel* 40, which runs concentrical, or on the same Arbor with the second *Pinion* 5. If you multiply 99 by the last Quotient 8, it produces 792, which is the Number of *Turns* the third *Pinion* 5 hath.

TURN, is the Sheriff's Court, kept twice every Year, viz. within a Month after *Easter*, and within a Month after *Michaelmas*. *Magna Charta*, cap. 35. From this Court are exempted only Archbishops, Bishops, Earls, Barons, all religious Men and Women, and all such as have Hundreds of their own to be kept. It is a Court of Record, in all things that pertain to it : It is also the King's Leet through all the Country, and the Sheriff's Judge ; and this Court is incident to his Office.

TURN-Pikes, in the Art of War, are Spars of Wood of 12 or 14 Foot long, and about 6 Inches Diameter in a sexangular Form : They are bored with Holes, one right under another, about an Inch Diameter ; the Axis of each Hole must be six Inches one from another, but to go by *Turns* from each side, the Pickets that are driven into the Hole, are 6 or 5 Foot long, pointed with Iron, and with Wedges or Nails fasten'd hard into the Holes.

Two of these fasten'd together with an Iron Chain and Staple, some 6 Inches long, will be of great Use to stop the Enemies in the Breaches, or elsewhere. But those that are intended to be thrown in Breaches, must be made of Oak, and need not be so big, or the Pickets so long.

TURNO Vicecomitum, is a Writ that lies for those that are called to the Sheriff's *Turn* out of their own Hundred.

TUSCAN Order of Architecture ; so called, because invented in *Tuscany*, an eminent Part of *Italy*. 'Tis the most plain of all the 5, and is seldom us'd but in some Country Building, where there is no need of any Order but one ; or else in some very great Building, such as an *Amphitheatre*, or the like, where all the Orders are design'd to be used.

The Columns here, together with Base and Capital, are to be 7 Modules in Length, and to have their Thickness diminish'd by degrees to a quarter Part. When these Columns stand alone, the Spaces between them, or the *Inter-columns*, ought to be very large.

Their Pedestals ought to be one Module high ; and the Base of the Column ought to be of the Height of half its Thickness ; and that Height divided into two equal Parts, makes the *Orle* or *Plinth*,

Plinth, which is made with a kind of Compals; the other is divided into 4 Parts, of which, one is for the *Lift*, the other for the *Tore*, or thick round Circle of the Pillar.

The *Base* hath a *Saille* or Bearing out, which is the 16th Part of the Diameter of the Column.

The *Capital* is an Height half the Thickness of the Column at the *Base*; and is divided into three equal Parts (according to *Ozanam*), of which, one is for the *Abacus*, the other for the *Oeuf*, as they call it in *French*, i. e. the *Ornament*; and the third Part being divided into 7 Divisions, the first makes the *Lift* under the *Ornament*; and the other six serve for the *Gorgerin Collier*, or *Frise*. The *Astragal* is the Height of the *Lift* below the *Ornament*.

TUSCAN Work, in Architecture, is the most simple and rude of the Five ancient Orders of Pillars: See *Column* and *Order*.

TWIGILD: See *Angild*.

TWILIGHT, is that dubious half Light which we perceive before the Sun-rising, and after Sun-setting. 'Tis occasion'd by the Earth's Atmosphere and the Splendor of the *Aether* which environs the Sun. The *Ethereal* accended Atmosphere of the Sun, not setting so soon as, and rising before the Sun; and the Sun's Rays also illuminating the Earth's Atmosphere, before the Body of the Sun itself can appear, occasions a Light always preceding at the Rise, and subsequent to the Setting of that Planet. Which, tho' because of many accidental Variations in both the Sun's and Earth's Atmosphere, it cannot be always of the same Degree of Duration or Brightness; yet it usually holds in the Evenings, till the Sun is about 18 Degr. below the Horizon, and appears so long before his Rise in the Morning: And therefore will be least under the Equator, where the Sun rises and sets at Right-Angles to the Horizon; and so will increase more and more, according as the Position of the Sphere grows more oblique: For, in our Latitude, for a good Part of the Year, the Sun is never above 18 Degrees below the Earth; and consequently, all that Time we have no Night, but continual Twilight.

TYMPAN, in Architecture, is that Part of the Bottom of the *Fronçons*, which is enclosed between the *Cornices*, and answers the Naked of the *Frise*.

TYMPAN of an Arch, is a Triangular Table placed in its Corners.

The most simple of these *Tympans* have only a Table hollow'd, sometimes with the Branches of Lawrel, Olive-Tree, or Oak, or with Trophies, and are conformable to the *Doric* and *Ionick* Orders. But the richest are adorn'd with flying Figures, as *Fame*; or sitting Figures, as those of the *Cardinal Virtues*, and are proper for the *Corinthian* and *Composite* Orders.

Tympan, is also attributed to the Pannels of Doors in Joiners Work, and to the *Dye* or Square of Pedestals.

TYMPANITES, *Tympantias*; the Disease call'd the *Tympany* is a fix'd, constant, equal, hard, resisting Tumour of the *Abdomen*, which being beat

or struck, yields a Sound. It proceeds from a stretching Inflation of the Parts, and of the Membranaceous Bowels, whose Fibres are too much swoln with Animal Spirits, and hindered from receding by the Nervous Juice, which obstructs the Passage; to which Distemper there is consequently added, as the Complement of all, an abundance of stantent Matter in the Places that are empty. *Blanchard*.

TYMPANUM, or rather *Tympani Membrana*, the Drum, or the Skin of the Drum of the Ear, is a small, thin, orbicular, transparent, nervous and dry Membrane, of most exquisite Sense, stretched over the Cavity of the inner Part of the Ear, and dividing between the inward and outward Ear. Some will have it spring from the *Pericranium*, others from the *Dura-mater*, others from the *Pia-mater*, and others from the softer Process of the auditory Nerve there expanded; and there are some Anatomists, which believe it hath a Substance proper to its self, made in the first Formation of the Parts, and springing from nothing else. It is very dry, that it may give the better Sound; and strong to bear external Injuries the better. It is enshased in a Channel made in the circumference of the outer End of the Bone that joins to the Cartilage which forms the largest Part of the *Meatus Auditorius*; and it hath a Cord which runs a-cross it behind, which some take for a Ligament to strengthen it; but *Verney* saith, 'tis a Branch of the 7th Pair of Nerves which supplies Twigs to the Muscles that move the *Tympanium*, which are two in Number. When this *Membrana Tympani* is taken away, there appears a Cavity on the inside of it, which is properly the *Tympanium*; but *Verney* will call it the *Barrel*. It's about a Quarter of an Inch long, and half an Inch wide; 'tis compass'd round with Bone, and clad within with a Membrane, which is interwoven with a great Number of Vessels. How Sounds are distinguish'd by means of this *Membrana Tympani*, and the four Bones, *Malleolus*, *Incus*, *Stapes*, and the *Oss. Orbiculare*, you will find at large under the Word *Ear*.

TYMPANUM, in Mechanics, is a Cylinder, but larger and shorter than the common Axis or Cylinder, which is the *Axis in Peritrochio*, and 'tis usually placed upon that Axis, and is much the same with the *Peritrochium*, which is a kind of Wheel placed on the Axis, in whose Circumference are Staves or Levers to turn the Axis easily about, in order to raise the Weight required.

TYPHODES, is a Symptomatical, continued burning Fever; as it were from the Inflammation of the Bowels. *Blanchard*.

TYPHOMANIA, is a *Delirium* with a Phrensy and a Lethargy. *Blanchard*.

TYPUS, or *Periodus* and *Circuitus*, is the Order that intermitting Fevers observe, consisting of Intension and Remission, of Encreasing and Decreasing, according to some kind of Regularity; and accordingly denominating the kind of the Fever by its Type. *Blanchard*.

TYROSIS, is when Milk which is eaten, curdles in the Stomach into a Substance like Cheese. *Blanchard*.

V A C

VACATION, by the Lawyers, is all the respective Time betwixt the End of one Term, and the Beginning of another.

It signifies also the time from the Death of a Bishop, or other Spiritual Person, 'till the Bishoprick, or other Dignity, be supplied with another.

VACUUM, is by Physiologists, supposed to be a Space devoid of all Body: And this they distinguish into a *Vacuum Diffeminatum*, or *Interpersum*; i. e. small void Spaces interpersed about between the Particles of Bodies:

Or, a *Vacuum Coacervatum*, which is a larger void Space made by the meeting together of the several Interpersed or Diffeminate Vacuities before mentioned.

That there is a *Vacuum*, at least a *Diffeminate* one, seems clear from the following Arguments.

1. That without supposing some Interpersed Vacuities among Bodies, 'tis very hard to account for Motion: For, if there be an absolute *Plenum*, the least Body in Nature cannot move, but all Bodies that are, must move with it; and yet into what Places they should move, when all Things are already full, is as hard to conceive, as the former.

2. Without allowing a *Vacuum*, how can there be any such thing as either *Rarefaction*, or *Condensation*? For, if all Space is adequately full of Body, nothing can possibly ever take up a greater or lesser Room than it had at first; and yet we find by evident Experience, that Air is capable of a very great Degree of Compression, and that Water can be rarified into Air, or Vapour, and then take up vastly larger Room, than it did before.

3. Sir Isaac Newton found, that the Weight of Bodies doth by no means depend on their Forms or Textures, but that all Bodies at equal Distances from the Earth, do equally gravitate towards it in Proportion to the Quantity of Matter in them, which is every where as their Weight: Wherefore, *there must of Necessity be a Vacuum*: For, if all Places were full, there could be no Difference in the Specifick Gravity of Bodies, but Air would be intensively as heavy as Gold; and so Gold could not descend in Air, and much less any lighter Body than it, which would contradict all the received Laws of Hydrostaticks, though confirm'd by Ten thousand Experiments.

In *VADO* *exponere*, is to Pawn, or leave any equivalent as a Pledge, or Surety of returning Money borrowed or owing.

VADIUM Mortuum, a Term in Law, signifying a Mortgage, Lands or immoveable Goods so pawn'd, or engaged to the Creditor, that he has a Right to the mean Profits for the Use of his Loan or Debt.

Per VADIUM ponere, in Law, signifies to take Security, Bail, or Pledges, for the Appearance of a Delinquent in some Court of Justice.

VAGINALIS Gula, the perforated Muscle of

V A L

the *Gula*, as *Willis* calls it; who says, The whole *Oesophagus* seems to consist of two Muscles; which make four Parallelograms with their opposite Fibres decussating each other: But in Men it is far otherwise; in whom the Fibres of this Muscle are Longitudinal, and Oblique; the former seem to take their Original at the Arytenoidal Cartilages, and passing somewhat Obliquely to the back Part of the *Oesophagus*, descend to the Stomach: The latter seems to be a Continuation of the *Pterigopharyngeus*, and the *Oesophagus*, descending obliquely in a Spiral manner, not unlike those of the Intestines described by the learned Dr. Cole.

VAGINALIS Tunica: See *Elythroides*.

VAIRY, or **VERRY**, is when the Field of a Coat of Arms is chequered into 2 Colours by the Figures of little Bells; and if these Colours are Argent and Azure, 'tis *Vairy Proper*, and you need say no more but *Vairy*: But if the Colours are any other, they must be expressly named in Blazoning the Coat: See the Form of it under *Verry*.



VAIRY Coppy, or **Potent Counter-Potent**, is a Bearing in Heraldry of this Figure, and in Blazon, the Colours must be expressed; as *Azure and Argent*, &c.

VALORE Maritagii, is a Writ: See *Value of Marriage*.

VALUE of Marriages, or **Valore Maritagii**, is a Writ that lies for the Lord, having proffered covenantable *Marriage* to the Infant, without Disparagement, if he refuse to take the Lord's Offer, to recover the *Value* of the *Marriage*: See *Stat. 12 Car. 2. cap. 24*.

VALVULA Major, is the upper Part or Cover of the *Isthmus*, which is betwixt the *Testes*, and the foremost Vermicular Process of the *Cerebellum*, to which two it is tied at its two Ends, and to the Processes that come from the *Cerebellum* to the *Testes*, at its Sides. 'Tis of a Medullary Substance; its Use is to keep the *Lympha* from falling out above the Nerves in the Basis of the Skull.

VALVES, are little thin Membranes in Vessels, or Fibres, like Folding-doors as it were; they have received different Names, according to the Diversity of their Figuration, as *Sigmoides*, like the Greek Letter *Sigma*; *Semilunares*, like an Half-Moon, &c. They are found in Veins, Arteries, and in the Lymphatick and Lacteal Vessels; nay, as some say, even in the Musculous Fibres. There are

VALVES also found in the Intestines, in the small and great Guts, especially in the *Jejunum*, and about the Beginning of the *Ilium*, which are called Semi-circular from their Figure. These Valves, or Folds, grow more and more Oblique, by little and little, the nearer you come to the *Ilium*, and at the Beginning of the *Ilium*, they are less Oblique than further on.

In like manner, near the End of the *Jejunum*, they are gradually more and more distant from one another, and so in the *Ilium* too.

At the Beginning, and in the Middle of the *Jejunum*, they are scarce distant half a Thumb's breadth; in the *Ilium* a whole Thumb's breadth, and more.

They yield a little if thrust with your Finger, and move here and there: At the Beginning of the *Colon* there is a Flethy and Circular Valve, besides several others in that Gut.

The Use of them is to stop the Meat a little, that it may be the better fermented, the Chyle distributed, adjacent Parts be cherish'd with Heat; and lastly, That it ascends or returns not again.

VALVULÆ *Conniventes*: See *Conniventes*.

VANE. Those *Sights* which are made to move and slide upon *Cross-staves*, *Forestaves*, *Davis's Quadrants*, &c. the Seamen call *Vanes*.

VAN-GUARD, a Military Term, signifying the first Line of an Army drawn up in *Battalia*. This is the same with the Front of an Army, and gives the first Charge upon the Enemy.

VAPORARIUM, is when the Patient sits so as that he receives the Vapours through an Hole, under which there is placed a Pot full of opposite and boiling hot Ingredients, which cooling, fresh Matter is added.

VAPOROSUM *Balneum*: See *Balneum Vaporis*.

VAPOURS, in a Medical Sense, is now a-days used for the Disease called otherwise *Hysterick*, or *Hypocondriack Fits*, or *Melancholy*: But the most common Sense of the Word, is for Warry Exhalations raised up either by the Heat of the Sun, the Subterranean, or any other accidental Heat, Fire, &c.

Mr. Halley, in *Philosophical Transactions*, N^o 189. gives an Estimate of the Quantity of Vapours raised out of the Sea, by the Warmth of the Sun, by an Experiment as follows.

We took a Pan (saith he) about 4 Inches deep, and 7 or 9 Inches in Diameter, in which we placed a Thermometer, and by means of a Pan of Coals, we brought the Water to the same Degree of Heat which is observed to be that of our Air in the hottest Summers; the Thermometer nicely shewing it.

Then we affixed the Pan of Water with the Thermometer in it, to one end of the Beam of the Scales, and exactly counterpoised it with Weights in the other Scale: And by the Application or Removal of the Pan of Coals, we found it very easy to maintain the Water in the same precise Degree of Heat.

Doing thus, we found the Weight of the Water sensibly to decrease; and at the end of 2 Hours we observed, That there wanted half an Ounce of Troy, all but 7 Grains, or 233 Grains of Water, which in that Time had gone off in Vapour, tho' one could hardly perceive it to smok, and the Water was not sensibly warm.

This Quantity in so short a Time, seemed very considerable, being little less than 6 Ounces in 24 Hours, from so small a Surface as a Circle of 8 Inches Diameter.

To reduce therefore this Experiment to an exact *Calculus*, and to determine the Thickness of that Skin of Water, which had so evaporated, I assume the Experiment alledged by Dr. Edward Bernard, to have been made in the *Oxford Society*, viz. That a Cube-Foot (English) of Water, weighs

exactly 76 Pounds Troy. This divided by 1728 the Number of Inches in a Foot, will give $253\frac{1}{3}$ Grains, or half an Ounce, $13\frac{1}{3}$ Grains for the Weight of a Cube-Inch of Water; wherefore the Weight of 233 Grains is $\frac{233}{13\frac{1}{3}}$, or 35 Parts of 38 of a Cube-Inch of Water.

Now the Area of the Circle, whose Diameter is 72 Inches, is 49 Square Inches; by which dividing the Quantity of Water evaporated, viz. $\frac{233}{13\frac{1}{3}}$ of an Inch, the Quote $\frac{35}{1728}$, or $\frac{1}{48}$, shews, that the Thickness of the Water evaporated, was the Fifty-third Part of an Inch; but we will suppose it only the Sixtieth Part, for the Facility of Calculation.

If therefore Water as warm as the Air in Summer, exhales the Thickness of a sixtieth Part of an Inch in two Hours, from its whole Surface, in 12 Hours it will exhale the $\frac{1}{5}$ of an Inch; which Quantity will be found abundantly sufficient to serve for all the Rains, Springs and Dews, and account for the *Caspian Seas* being always at a stand, neither wasting nor overflowing; as likewise for the Current laid to set always in at the Straights of *Gibraltar*, though those *Mediterranean Seas* receive so many, and so considerable Rivers.

To estimate the Quantity of Water arising in Vapour out of the Sea, I think I ought to consider it only for the Time the Sun is up; for that the Dews return in the Night, as much if not more Vapours than are then emitted; and in Summer, the Days being longer than twelve Hours, this Excess is ballanced by the weaker Action of the Sun, especially, when arising before the Water be warmed: So that if I allow $\frac{1}{10}$ of an Inch of the Surface of the Sea, to be raised *per Diem* in Vapours, it may not be an improbable Conjecture.

Upon this Supposition, every ten Square Inches of the Surface of the Water, yields in Vapour *per Diem*, a Cube-Inch of Water; and each Square Foot half a Wine-pint; every Space of four Foot Square, a Gallon; a Mile Square, 6914 Tons; a Square Degree, suppos'd of 69 English Miles, will evaporate 33 Millions of Tons: And if the *Mediterranean* be estimated at 40 Degrees long, and four broad, Allowances being made for the Places where it is broader, by those where it is narrower, (and I am sure, I guess at the least) there will be 160 Square Degrees at Sea; and consequently the whole *Mediterranean* must lose in Vapour, in a Summer's Day at least 5280 Millions of Tons, and this Quantity of Vapour, though very great, is as little as the Remains of another Cause, which cannot be reduced to Rule, I mean the Winds, whereby the Surface of the Water is lick'd up sometimes faster than it exhales by the Heat of the Sun; as is well known to those that have considered those Drying Winds which blow sometimes.

To estimate the Quantity of Water the *Mediterranean Sea* receives from the Rivers that fall into it, is a very hard Task, unless one had the Opportunity to measure their Channels and Velocity; and therefore we can only do it by allowing more than enough: That is, by presuming these Rivers greater than in all Probability they be, and then comparing the Quantity of Water voided by the *Thames*, with that of those Rivers whose Waters we desire to compute.

The

The *Mediterranean* receives these considerable Rivers ; The *Iberus*, the *Rhone*, the *Tiber*, the *Po*, the *Danube*, the *Neister*, the *Boryphenes*, the *Tanais* and the *Nile* ; all the rest being of no great Note, and their Quantity of Water inconsiderable.

These nine Rivers, we will suppose each of them to bring down ten times as much Water as the River of *Thames* ; nor that any of them are so great in Reality, but to comprehend with them all the small Rivulets that fall into the Sea, which otherwise I know not how to allow for.

To calculate the Water of the *Thames*, I assume that at *Kingston-Bridge*, where the Flood never reaches, and the Water always runs down, the Breadth of the Channel is 100 Yards, and its Depth three, it being reduced to an Equality ; (in in both which Suppositions I am sure I take with the most.)

Hence the Profile of the Water in this Place, is 300 Square Yards : This multiplied by 48 Miles, (which I allow the Water to run in 24 Hours, at two Miles an Hour) or 84480 Yards, gives 25344000 Cubick-Yards of Water to be evacuated every Day : That is 20300000 Tons *per Diem* : And I doubt not but in the Excess of my Measures of the Channel of the River, I have made more than sufficient Allowance for the Waters of the *Brent*, the *Wandel*, the *Lea*, and *Darwent*, which are all worth Notice, that fall into the *Thames* below *Kingston*.

Now, if each of the aforesaid nine Rivers yield ten Times as much Water as the *Thames* doth, 'twill follow, that each of them yield but 203 Millions of Tons *per Diem*, and the whole nine but 1827 Millions of Tons in a Day ; which is but little more than one third of what is proved to be raised in Vapour out of the *Mediterranean* in Twelve Hours Time.

Now what becomes of this Vapour when rais'd, and how it comes to pass that the Current always sets in at the Mouth of the Streights of *Gibraltar*, is intended, with Leave, for a farther Entertainment of this Honourable Company.

In the mean Time, it is needful to advertise the Reader, That in making the Experiment herein mentioned, the Water used, had been salted to the same Degree, as is the common Sea-Water, by the Solution of about a fortieth Part of Salt.

The Quantity of Vapours drawn by any determinate Heat from any Quantity of Water in a determinate Time is always proportionable to the Surface of that Water : So that from a double Surface there will be raised a double Quantity of Vapour, from a triple Surface, a triple Quantity, &c.

For the Manner how, and the Reason why Vapours are raised by Heat, Mr. *Halley* gives the following Account.

He hath shewed, That if an Atom of Water be expanded into a Shell or Bubble, whose Diameter shall be Ten times as great as before, such an Atom will be specifically lighter than Air, and will rise so long as that Flatus or warm Spirit which first separated it from the Mass of Water, shall continue to distend it to the same Degree : But then that Warmth declining, and the Air growing cooler, and with all specifically lighter, these Vapours will stop at a certain Region of the Air, or else descend.

If therefore it should be supposed, That the whole Earth were covered with Water, and that the Sun as now should make his Diurnal Course round it, this Learned Person thinks, That the Air would be impregnated with a certain Quantity of Aqueous Vapours, which it would retain it in like Salts dissolved in Water ; and that the Sun in the Day time warming this Air, that part of the Atmosphere would sustain a greater Proportion of Vapours ; (as warm Water will hold more Salt dissolved in it than cold ;) which on the Absence of the Vapours at Night, would be discharged in Dews.

And in this Case he concludes, there could be no Diversity of Weather, other than Periodically every Year alike, the Mixture of all Terrestrial, Saline, and Heterogeneous Vapours being here excluded ; which he judges to be when variously compounded and driven by Winds, the Causes of those various Seasons and Changes of Weather which we now find.

But if instead of an Earth covered all over with Water, you suppose the Sea interspersed about wide and spacious Tracts of Land, and also divided by high Ridges of Mountains, such as the *Pyrenean*, the *Alps*, and the *Appenine* in Europe : *Taurus*, *Caucasus*, *Imaus*, &c. in Asia ; Mount *Atlas*, and the Mountains of the Moon in Africa : And the *Andes* and *Apalatean* Mountains in America ; each of which far surpass the usual Height to which the Aqueous Vapours of themselves ascend, and on the Tops of which, the Air is so cold, and rarified, as to retain but a small Part of those Vapours which are brought thither by the Winds.

The Vapours therefore thus rais'd from the Sea, and by the Winds carried over the Low-Lands to those Ridges of Mountains, are there compelled by the Stream of the Air, to mount with it up to their Tops, where the Water presently precipitates, gleeting down by the Crannies of the Stones ; and part of the Vapour entering into the Caverns of the Hills, the Water thereof gathers as in an Alembick in the Basons of Stone which it finds ; and these being once full, the Overplus of the Water runs down at the lowest Place of the Bason, and breaking out by the Sides of the Hills, forms *Single Springs* :

Many of which running down by the Valleys, or Guts, between the Ridges of the Hills, and after uniting, form little Rivulets, or Brooks ; and many of these meeting again in a common Channel from large Rivers.

And in this Theory, the Author saith, he was confirmed by Experience at *St. Helena* ; where residing to make Celestial Observations, the Place being about 800 Yards above the Surface of the Sea, there was every Night such a Condensation, or rather Precipitation of the Vapours, as that, tho' the Sky was clear, they would cover every half Quarter of an Hour the Object-Glasses of his Telescopes, and wet his Paper to that it would hardly bear Ink to write his Observations. *Philosophical Transactions*, N^o 192.

The Learned Dr. *Woodward* supposes the great Abyfs of Water in the Bowels of the Earth to be the Promptuary from whence the Water of Springs and Rivers is chiefly deduced : See *Springs*.

Mr. *Homberg*,

Mr. *Homborg*, in some Experiments which he hath published in the *Memoires de Mathematique & de Physique*, for the Month of *May*, 1693. says, That the most probable Cause of the Elevation of Vapors in general, is that the Fiery or Æthereal Matter first puts the small Particles of the Water into an Agitation, and then mingles it self with it; which Mixture is what we call *Vapors*; this being specifically lighter than Air, will rise in it, 'till it come to such an height, as that the Air is there of the same relative Gravity with it self, and there it will swim about, 'till by the Motion of Winds, or other Causes, its Constitution is broken, and so the watry Parts uniting together in greater Drops, it descends in Dew, or Rain: Which Notion differs very little from Mr. *Halley's*. Only *Homborg*, by an Experiment which he made of Evaporation in *Vacuo*, concludes, That Air is not necessary to the first rising of Vapors, but only to the making of them mount up on high, after they once are brought or raised into it.

VARIATION is, according to *Tycho*, the third Inequality in the Motion of the Moon; and arises from her *Apogæum*, being changed as her System is carried round the Sun by the Earth. *Bullialdus* calls this the Moon's *Reflexion*, expressing it, That her *Apogæon* reflects backwards contrary to the Order or Succession of the Signs, by reason of which the Angle of her *Evection* is sometimes more, and sometimes less, than it would appear to be, by considering only the two other Inequalities. But *Tycho* asserts this *Variation* to be never less than 40 Minutes, 30 Seconds.

Sir *Isaac Newton* thinks the *Variation* is caused partly by the Elliptick Form of the Moon's Orbit, and partly by the Inequality of the Moments of the Area which the Moon describes by a Radius drawn to the Earth. This, *Prop. 29. Book 3.* of his *Principia*, he shews how to find; and sets

it at a middle Rate, to be 35 Minutes, 9 Seconds.

VARIATION of the Needle, or Compass, is the Deviation, or Turning of the Magnetical Needle in the *Mariners Compass*, from the true North-point; which happens more or less in most Places; and is commonly called by Sea-men the North-Easting, or North-Westing of the Needle.

To find the Variation at Sea.

About three Hours before or after Noon, having the *Sun's Declination*, his *Altitude*, and the Latitude of the Place, find his true *Azimuth*, (as is directed under that Word) observe also the *Sun's Magnetical Azimuth*, and then the Differences of those two Distances from the *Meridian*, is the *Variation of the Compass*.

The same is also found by having the *Sun's True and Magnetical Amplitude*.

For if the Amplitudes be of one kind; that is, both North, or both South, their Difference is the *Variation*: But if of different kinds; that is, one North, the other South, their Sum is the *Variation*.

In the Practice of observing the *Variation*, it is usual to take it by the Amplitude of the Rising and Setting of the Sun, when his Centre appears in the *Visible Horizon*; whereas he ought to be observed when his under Limb is still above the *Horizon* about two Thirds of his Diameter, or 20 Minutes, because of the Refraction, and the Height of the Observer's Eye above the Surface of the Water; or else to work the Amplitudes, as the Azimuths, by reckoning the Sun's Distance from the Zenith, 90 Degrees 36 Minutes. This, tho' it be of little Consequence near the Equinoctial, will make a great Error in high Latitudes, where the Sun Rises and Sets Obliquely.

A Table of the Variation of the Compass, as it hath been observed in divers Places, and at divers Times.

Names of Places.	Longitude from London.	Latitude.	Anno Dom.	Variation observed.
	Deg. Min.	Deg. Min.		Deg. Min.
London, - - - - -	00 00	51 32 N	1580	11 15 E
			1622	6 00 E
			1634	4 5 E
			1672	2 30 W
			1683	4 30 W
Paris, - - - - -	2 25 E	48 51 N	1640	3 00 E
			1666	0 0
			1681	2 30 W
Uraniburg, - - - - -	13 00 E	55 54 N	1672	2 35 W
Copenhagen, - - - - -	12 53 E	55 41 N	1649	1 30 E
Dantzick, - - - - -	19 0 E	54 23 N	1679	7 00 W
Mompelien, - - - - -	4 0 E	43 37 N	1574	1 10 W
Brest, - - - - -	4 25 W	48 23 N	1680	1 45 W
Rome, - - - - -	13 0 E	41 50 N	1681	5 0 W
Bayonne, - - - - -	1 20 W	43 33 N	1680	1 20 W
Hudson's Bay, - - - - -	79 40 W	51 00 N	1668	19 15 W
In Hudson's Streights, - - - - -	57 00 W	61 00 N	1668	29 30 W
In Baffin's Bay, at Sir Thomas Smith's Sound, - - - - -	80 0 W	78 00 N	1516	57 00 W
At Sea, - - - - -	50 0 W	38 40 N	1682	7 30 W
At Sea, - - - - -	31 30 W	43 50 N	1682	5 30 W
At Sea, - - - - -	42 00 W	21 0 N	1678	0 40 E
Cape St. Augustine, - - - - -	35 30 W	8 0 S	1670	5 10 E
At Sea off the Mouth of R. Plata, - - - - -	58 0 W	39 30 S	1670	20 30 E
Cape Frio, - - - - -	41 10 W	22 40 S	1670	12 10 E
At the East Entrance of Magellan Streights, - - - - -	68 0 W	52 30 S	1670	17 00 E
At the West Entrance of Magellan Streights, - - - - -	75 0 W	53 0 S	1670	14 10 E
Baldivia, - - - - -	73 0 W	40 0 S	1670	8 10 E
Cape Agulhas, - - - - -	16 30 E	34 50 S	1622	2 0 W
			1675	8 0 W
At Sea, - - - - -	1 00 E	34 30 S	1675	0 0
At Sea, - - - - -	20 0 W	34 0 S	1675	10 30 E
At Sea, - - - - -	32 0 W	24 0 S	1675	10 30 E
St. Helena, - - - - -	6 30 W	16 0 S	1677	0 40 E
J. Ascension, - - - - -	14 10 W	7 50 S	1678	1 0 E
Jobanna, - - - - -	44 00 E	12 15 S	1675	19 30 W
Mombasa, - - - - -	40 00 E	4 0 S	1675	16 0 W
Zocatra, - - - - -	56 0 E	12 30 N	1674	17 0 W
Aden, at the Mouth of the Red Sea, - - - - -	47 30 E	21 00 N	1674	15 0 W
Diego Roiz, - - - - -	61 0 E	20 0 S	1676	20 30 W
At Sea, - - - - -	64 30 E	0 0	1676	15 30 W
At Sea, - - - - -	54 0 E	27 0 S	1676	24 0 W
Bombay, - - - - -	72 30 E	19 0 N	1676	12 0 W
C. Comorin, - - - - -	76 0 E	8 15 N	1680	8 48 W
Ballasore, - - - - -	87 0 E	21 30 N	1680	8 20 W
Fort St. George, - - - - -	180 0 E	13 15 N	1680	8 10 W
West Point of Java, - - - - -	104 0 E	6 40 S	1976	3 10 W
At Sea, - - - - -	58 0 E	39 0 S	1677	27 30 W
J. St. Paul, - - - - -	72 0 E	38 0 S	1677	23 30 W
At Van Diemens, - - - - -	142 0 E	42 25 S	1642	0 0
At New Zealand, - - - - -	170 0 E	40 50 S	1642	9 0 E
At Three King Isle in New Zealand, - - - - -	169 30 E	34 35 S	1642	8 40 E
J. Rotterdam in the South Sea, - - - - -	184 0 E	20 15 S	1642	6 20 E
On the Coast of New Guinea, - - - - -	149 0 E	4 30 S	1643	8 45 E
At the West Point of New Guinea, - - - - -	126 0 E	0 26 S	1643	5 30 E

From the foregoing Table 'tis observ'd by the Learned Capt. Halley.

1. That in all Europe, the Variation at this Time is *West*, and more in the Eastern Parts thereof than the Western, increasing that way.

2. That on the Coast of America, about Virginia, New England, and Newfoundland, the Variation is *Westerly*, increasing all the way as you go Northerly along the Coast, so as to be above 20 Degrees at Newfoundland, nearly 30 Degrees in Hudson's Streights, and not less than 37 Degrees in Bassin's Bay: And that as you sail Eastward from this Coast, the Variation diminishes.

Whence it is, That somewhere between Europe and the North part of America, there must be an Easterly Variation, or at least no Variation.

3. That on the Coast of Brazil, there is East Variation, increasing as you go to the Southward, so as to be 12 Degrees at Cape Frio, and 20 Degr. and half over-against R. Plata; and thence sailing South-westerly, to the Streights of Magellan, it decreases 17 Degrees, and at the West Entrance about 14 Degrees.

4. That the Eastward of Brazil, this Easterly Variation decreases, so as to be very little at St. Helena and Ascension, and to be quite gone, and the Compass Point true about 18 Degrees of Longitude West from the Cape of Good Hope.

5. That to the Eastward of the aforesaid Places, a Westward Variation begins, and governs in all the Indian Sea, arising to 18 Degrees under the Equator, about the Meridian of the Northern part of Madagascar; and 27 Degrees and a half in 39 Degrees South Latitude, near the same Meridian: Easterly from thence, the West Variation decreases, so as to be not much above 8 Degrees at Cape Comorin, and about 3 Degrees upon the Coast of Java; and about the Molucca Islands to be quite gone; as also a little to the Westward of Van Diemen's Land.

6. That to the Eastward of the Molucca's and Van Diemen's Land, in South Latitude, there arises another Easterly Variation, which seems not so great as the former, nor of so large Extent; for that at the Island Rotterdam, it is sensibly less than upon the East Coast of New Guinea; and at the rate it decreases, it may well be supposed, that about 20 Degrees further Eastward, or 225 Degrees East Longitude from London, in the Latitude of 20 Degrees South, a Westery Variation begins.

7. That the Variation taken at Baldivia, and at the West Entrance of the Streights of Megellan, shews, That the East Variation noted in the third Observation, is decreasing apace; and that it cannot well extend many Degrees into the South Sea, from the Coast of Peru and Chili, leaving room for a small Westery Variation in that Tract of the unknown World that lies in the mid-way between Chili and New Zealand, and between Hounds Island and Peru.

8. That in sailing North-west from St. Helena, by Ascension, as far as the Equator, the Variation

continues very small East, and as it were, constantly the same; so that in this part of the World, the Course, wherein there is no Variation, is evidently no Meridian, but rather North-west.

9. That the Entrance of Hudson's Streights, and the Mouth of R. Plata, being nearly under the same Meridian, at the one place the Needle varies 29 Degrees and a half West; at the other 20 Degrees and a half East.

Whence 'tis concluded,

That the whole Globe of the Earth is one great Magnet, having four Magnetical Poles, or Points of Attraction, near each Pole of the Equator two; and that in those Parts of the World which lie near adjacent to any one of those Magnetical Poles, the Needle is govern'd thereby, the nearest Pole being always predominant over the more remote.

And he conjectures, That the Pole, which is at present nearest to us, lies in or near the Meridian of the Lands-End of England, and not above 7 Degrees from the Arctic Pole; by this Pole the Variation in all Europe and Tarrary, and the North Sea, are principally govern'd; tho' with regard to the other Northern Poles, whose Situation is in the Meridian passing about the middle of California, and about 15 Degrees from the North Pole of the World; to this the Needle has chiefly respect in all the North America, and in the two Oceans on either side thereof, from the Azores Westwards to Japan, and farther.

The two Southern Poles are rather farther distant from the South Pole of the World: The one about 16 Degrees therefrom, in a Meridian some 20 Degr. to the Westward of Magellan's Streights, or 95 Degrees West from London; this commands the Needle in all South America, in the Pacifick Sea, and the greatest Part of the Ethiopick Ocean.

The fourth and last Pole seems to have the greatest Power, and largest Dominions of all, as it is the most remote from the Pole of the World, being little less than 20 Degrees distant therefrom, in the Meridian which passes through New Holland and the Island Celebes about 120 Degrees East from London; this Pole is predominant in the South part of Africa, in Arabia, and the Red Sea, in Persia, India, and its Islands; and all over the Indian Sea, from the Cape of Good Hope Eastwards, to the middle of the great South Sea that divides Asia from America.

This seems to be the present Disposition of the Magnetical Vertue throughout the whole Globe of the Earth: It remains to shew how this Hypothesis makes out all the Variations that have been observ'd of late; and how it answers to the several Remarks drawn from the Table.

And first, it is plain, that (our European North Pole being in the Meridian of the Lands-end of England) all places more Easterly than that, will have it on the West side of their Meridian; and consequently the Needle respecting it with its Northern Point, will have a Westery Variation, which will still be greater as you go to the Eastwards, till you come to some Meridian of Russia, where 'twill be greatest, and from thence decrease again. Thus at Brest the Variation being but 1 Degree and

3 Quarters at *London* 4 Degrees and a half; but at *Dantzick* 7 Degrees West. To the Westward of the Meridian of the *Lands-End* the Needle ought to have an Easterly Variation; were it not that (by approaching the *American Northern Pole*, which lies on the West side of the Meridian, and seems to be of greater force than this other) the Needle is drawn thereby Westward, so as to counter-balance the Direction given by the *European Pole*, and to make a small West Variation in the Meridian of the *Lands-End* it self. Yet about the Meridian of the *Ile Tercera*, 'tis supposed our nearest Pole may so far prevail, as to give the Needle a little Turn to the East; tho' but for a very little space; the Counter-balance of those two Poles permitting no considerable Variation in all the Eastern part of the *Atlantick Ocean*; nor upon the West Coast of *England* and *Ireland*, *France*, *Spain*, and *Barbary*: But to the Westward of the *Azores*, the Power of the *American Pole*, overcoming that of the *European*, the Needle has chiefly respect thereto; and turns still more and more towards it, as you approach it. Whence it comes to pass, that on the Coast of *Virginia*, *New-England*, *Newfoundland*, and in *Hudson's-Streights*, the Variation is Westward; that it increases as you go from thence towards *Europe*, and that it is less in *Virginia* and *New-England*, than in *Newfoundland* and *Hudson's-Streights*.

This Westerly Variation again decreases, as you pass over the *North America*, and about the Meridian of the middle of *California*, the Needle again points due North; and from thence Westwards to *Tedzo* and *Japan*, 'tis supposed the Variation is Easterly; and half Sea over, not less than 15 Degrees: And that this East Variation extends over *Japan*, *Tedzo*, *East-Tartary*, and part of *China*, till it meet with the Westerly, which is govern'd by the *European North Pole*, and which is the greatest somewhere in *Russia*.

Towards the South Pole the Effect is much the same, only that here the South Point of the Needle is attracted.

Hence it will follow, That the Variation on the Coast of *Brazil*, at the River of *Plate*, and so on to the *Streights of Magellan*, should be Easterly, if we suppose a Magnetical Pole situated about 20 Degrees more Westerly than the *Streights of Magellan*. And this Easterly Variation doth extend Eastward over the greatest part of the *Ethiopic Sea*, till it be counterpoiz'd by the Virtue of the other Southern Pole; as it is about mid-way between the *Cape of Good Hope*, and the *Isles of Tristan d'Acuntia*.

From thence Eastwards the *Asian South Pole* becoming prevalent, and the South Point of the Needle being attracted thereby, there arises a West Variation very great in Quantity and Extent, because of the great Distance of this Magnetical Pole of the World.

Hence it is, That all the *Indian Sea*, as far as *Hollandia Nova*, and farther, there is constantly West Variation; and that under the Equator it self, it arises to no less than 18 Degrees, where 'tis most.

About the Meridian of the Island of *Celebes*, being likewise that of this Pole, this Westerly Variation ceases, and an Easterly begins, which reaches to the middle of the South Sea, between the middle of *Zelandia Nova* and *Chili*, leaving room for a

small West Variation govern'd by the *American South Pole*.

From all this it appears, That the Direction of the Needle in the Temperate and Frigid Zone, depends chiefly upon the Counterpoise of the Forces of two Magnetical Poles of the same Nature: As also how it is, that under the same Meridian, the Variation should be in one place 29 Degrees and a half West, and in another 20 Degrees and a half East.

In the *Torrid Zone*, and particularly under the Equinoctial, respect must be had to all four Poles, and their Positions well consider'd; otherwise it will not be easie to determine what Variations shall be; the nearest Pole being always strongest; yet not so, as not to be counter-balance'd sometimes by the united Forces of two more remote; as is noted in the Eighth Observation, that in sailing from *St. Helena*, by the *Ile of Ascension*, to the Equator, on the North-west Course, the Variation is very little Easterly, and in that whole Tract unalterable, because that the *South American Pole* (which is considerably the nearest in the aforesaid Places) requiring a great Easterly Variation, is counterpoiz'd by the contrary Attraction of the *North American*, and the *Asian South Pole*; each whereof singly are, in these Parts, weaker than the *American South Pole*; and upon the North-west Course, the Distance from this latter is very little varied; and as you recede from the *Asian South Pole*, the Balance is still preserv'd by access towards the *North American Pole*. In this Case no notice is taken of the *European North Pole*; its Meridian being little remov'd from those of these Places, and of it self requiring the same Variations we here find.

After the same manner you may proceed to determine the Variations in other places, under and near the Equator.

All this seems very much to confirm the aforesaid Hypothesis, That there are in the Earth four such Magnetical Points, or Poles, which occasion the great Variety, and seeming Irregularity, which is observed in the Variation of the Compass.

But to calculate exactly what it is, in any Place assign'd, is not as yet done, nor is it determin'd in what Proportion the attractive Power decreases, as you remove from the Pole of the Magnet; as also the Change of the Variation, and at what rate, is not yet perfectly discovered.

From the foregoing Table, it should seem, that all the Magnetical Poles had a Motion Westward; but if it be so, 'tis evident, That it is not a Rotation about the Axis of the Earth; for then the Variations would continue the same, in the same Parallel of Latitude (the Longitude only changed) as much as the Motion of the Magnetical Poles: But the contrary is found by Experience; for there is no where in the Latitude of 51 and an half North, between *England* and *America*, a Variation of 11 Degrees East, at this time; as it was once here at *London*. Wherefore it seems that our *European Pole* is grown nearer the Pole *Arctic* than it was heretofore; or else that it has lost part of its Virtue.

But whether these Magnetick Poles move altogether with one Motion, or with several, whether equally, or unequally; whether circular, or libratory: If circular, about what Centre; if libratory, after what manner, things yet unknown.

In

In *Philos. Transl.* N. 195. Capt. *Halley* brings the following *Hypothesis*, accounting for this *Variation*, and solving all its *Phenomena's*; which is thus:

He reckons the external Parts of the Globe as the Shell, and the internal as a *Nucleus*, or inner Globe, included within ours, with a fluid Medium between, which having the same common Centre and Axis of Diurnal Rotation, may turn about with our Earth each 24 Hours; only this outer Sphere having its turbinating Motion, (some small matter either swifter or slower than the internal Ball. And a very minute Difference in Length of Time, by many Repetitions, becomes sensible; the internal Parts will by degrees recede from the external; and not keeping pace with one another, will appear gradually to move, either Eastward or Westward, by the Difference of their Motions.

Now supposing such an internal Sphere having such a Motion, the two great Difficulties in the former Hypothesis is easily solv'd: For if this exterior Shell of Earth be a Magnet, having its Poles at a distance from the Poles of Diurnal Rotation; and if the internal *Nucleus* be likewise a Magnet, having its Poles in two other places distant also from the Axis; and these latter, by a gradual and slow Motion, change their Place in respect of the External: We may then give a reasonable Account of the four Magnetical Poles aforementioned, as likewise of the Changes of the Needle's Variations.

The Period of this Motion being wonderful great, and there being hardly an hundred Years since these Variations have been duly observ'd, it will be very hard to bring this *Hypothesis* to a *Calculation*, especially since, tho' the Variations do increase and decrease regularly in the same place, yet in differing places, at no great distance, there are found such casual Changes thereof, as can no ways be accounted for by a regular Hypothesis, as depending upon the unequal and irregular Distribution of the Magnetical Matter within the Substance of the external Shell or Coat of the Earth, which deflect the Needle from the Position it would acquire from the Effect of the general Magnetism of the whole.

Of this, the *Variations* at *London* and *Paris* give a notable Instance; for the Needle has been constantly about $1\frac{1}{2}$ more Easterly at *Paris* than at *London*: Tho' it be certain, that according to the general Effect, the Difference ought to be contrary way; notwithstanding which, the Variations in both places do change alike.

Hence, and from some other things of like nature, it seems plain, that the two Poles of the external Globe are fix'd in the Earth, and that if the Needle were wholly govern'd by them, the *Variations* thereof would be always the same, with some Irregularities upon the Account but just now mention'd. But the internal Sphere having such a gradual Translation of its Poles, does influence the Needle, and direct it variously, according to the Result of the attractive or directive Power of each Pole; and consequently, there must be a Period of the Revolution of this internal Ball; after which, the Variations will return again, as before. But if it shall in future Ages be observed otherwise, we must then conclude, that there are more of these internal Spheres, and more Magnetical Poles

than Four, which, at present, we have not a sufficient number of Observations to determine, and particularly in that vast *Mer. del Sur*, which occupies so great a part of the whole Surface of the Earth.

If then, two of the Poles be fix'd, and two moveable, it remains to ascertain, which they are that keep their Place. And it were to be wish'd we had the Experience of another Century of Years to found our Conclusions upon: Yet he thinks it may be safely determined, that our *European North Pole* (which is supposed to be near the Meridian of the *Lands-End* of *England*, and about 7 Deg. therefrom) is that that is moveable of the two Northern Poles, and that that has chiefly influenced the Variations in these Parts of the World: For in *Hudson's Bay*, which is under the Direction of the *American Pole*, the Change is not observ'd to be near so fast, as in these Parts of *Europe*, tho' that Pole be much farther removed from the Axis.

As to the *South Poles*, he takes the *Asian Pole* which he places about the Meridian of the Island *Celebes* to be fixed, and consequently the *American Pole* to move, from the like Observation of the slow decrease of the Variation on the Coast of *Java*, and near the Meridian of the *Asian Pole*; tho' he owns to have no Account of the Effects of the other beyond *Magellan Straights*.

This being granted, 'tis plain, That the fixed Poles, are the Poles of this external Shell or *Cortex* of the Earth; and the other two, the Poles of the Magnetical *Nucleus*, included and moveable within the other. It likewise follows, that this Motion is Westwards; and, by consequence, that the aforesaid *Nucleus* has not precisely attain'd the same Degree of Velocity with the exterior Parts in their diurnal Revolutions; but so very nearly equals it, that in 365 Revolves, the Difference is scarce sensible.

This is supposed to arise from the Impulse whereby this diurnal Motion was impress'd on the Earth, being given to the external Parts, and from thence, in time, communicated to the internal; but not so, as perfectly to equal the Velocity of the first Motion impress'd on, and still conserv'd by the superficial Parts of the Globe.

As to the Quantity of this Motion, it is impossible to define it, both from the Nature of this kind of Observation, which cannot be very accurately perform'd; as also, from the small Time these Variations have been observ'd, and their Change discover'd. It appears by all Circumstances, that its Period is of many Centuries of Years, and as far as may be, collected from the Change of the Place, where there was no Variation by reason of the *Equilibrium* of the two Southern Magnetical Poles, viz. from *Cape d'Agulhas*, to the Meridian of *St. Helena* (which is about 23 Deg. in about 90 Years) and of the Place where the Westerly Variation is in its greatest Deflection, being about half so much, viz. from the Isle of *Diego Roiz*, to the South-west Parts of *Madagascar*; we may with some reason conjecture, that the *American Pole* has moved Westward 46 Degr. in that Time, and that the whole Period thereof is perform'd in 700 Years, or thereabouts: So that, the nice Determination of this, and of several other Particulars in the Magnetick System, is reserv'd for Posterity; all that we can hope to do, is to leave behind us Observations that may be confided in, and to propose Hy-

potheses

potheses which after Ages may examine, amend, and refute.

Thus, in order to explain the Change of the *Variations*, we have adventured to make the Earth hollow, and to place another Globe within it; not but that there may be several Objections against it; as,

That there is no Instance in Nature of the like thing.

That, if there was such a middle Globe, it would not keep its Place in the Centre, but be apt to deviate therefrom, and might possibly chock against the concave Shell, to the Ruin, or at least Endamaging thereof.

That the Water of the Sea would perpetually leak through, unless we suppose the Cavity to be full of Water.

That were it possible, yet it does not appear what Use such an inward Sphere can be of, being shut up in eternal Darknels, and therefore unfit for the Production of Animals, or Plants; with many more Objections, according to the Fate of all such new Propositions.

To these it may be briefly answer'd, That the Ring environing of the Globe of *Saturn*, is a notable Instance of this kind, as having the same common Centre, and moving along with the Planet, without sensibly approaching him on one side more than on the other. And if this Ring were turned on one of its Diameters, it would then describe such a concave Sphere as this external one is supposed to be. And since the Ring in any Position given, would in the same manner keep the Centre of *Saturn* in its own, it follows, That such a concave Sphere may move with another included in it, having the same common Centre: Nor can it well be supposed otherwise, considering the Nature of Gravity; for should these Globes be adjusted once to the same common Centre, the Gravity of the Parts of the Concave, would press equally towards the Centre of the inner Ball; which Equality must necessarily continue till some external Force disturb it, which is not easie to imagine in this Case. And, perhaps, this might be more intelligibly express'd, by saying, That the inner Globe being posited in the Centre of the Exterior, must necessarily ascend which way soever it moves; that is, it must overcome the Force of Gravity pressing towards the common Centre, by an Impulse it must receive from some outward Agent. But all outward Efforts being insufficiently fenced against, by the Shell that surrounds it, it follows, That this *Nucleus* being once fix'd in the common Centre, must always there remain.

As to the Leaking of the Water through this Shell, when once a Passage shall be found for it to run through, is confes'd to be an Objection seemingly of weight; but by considering how rightly great Beds of Chalk or Clay, and much more Stone, do hold Water, and even Caves arch'd with Sand, no Man can doubt but the Wisdom of the Creator has provided for the Microcosm, by many more Ways than can be either imagin'd or express'd; especially since we see the admirable and innumerable Contrivances wherewith each worthless Individual is furnish'd, both to defend it self, and pro-

pagate its Species: What Curiosity in the Structure; what Accuracy in the Mixture and Composition of the Parts ought not we to expect in the Fabrick of this Globe, made to be the lasting Habitation of so many various Species of Animals, in each of which, there want not many Instances that manifest the boundless Power and Goodness of their Divine Author; and can we then think it a hard Supposition, that the internal Parts of this Bubble of Earth should be replere with such *Saline* and *Vitriclick* Particles, as may contribute to Petrefaction, and dispose the transuding Water to shoot and coagulate into Stone, so as continually to fortify, and, if need were, to consolidate any Breach or Flaw in the concave Surface of the Shell.

And perhaps this may not without reason be supposed to be the final Cause of the Admixture of the magnetical Matter in the Mass of the terrestrial Parts of our Globe, viz. To make good and maintain the concave Arch of this Shell: For, by what the Excellent Sir *Is. Newton* has shewn in his *Principia Philosophiæ*, it will follow, that according to the general Principle of Gravity, visible throughout the whole Universe, of those Particles that by Length of Time, or otherwise, shall moulder away, or become loose on the concave Surface of the external Sphere, would fall in, and with great Force descend on the internal, unless those Particles were of another sort of Matter, capable by their stronger Tendency to each other, to suspend the Force of Gravity; but no other Substance is known capable of supporting each other by their mutual Attraction, but the Magnetical; and these we see miraculously to perform that Office, even where the Power of Gravity has its full Effect; much more within the Globe, where it is weaker. Why then may we not suppose these said Arches to be lined throughout with a magnetical Matter, or rather, to be one great concave Magnet, whose two Poles are the Poles we have before observ'd to be fix'd in the Surface of our Globe.

Another Argument favouring this Hypothesis, is drawn from a Proposition of the same Sir *Isaac Newton*, where he determines the Force wherewith the Moon moves the Sea in producing the Tides; his Words are, *Densitas Lunæ est ad densitatem Terræ ut 680 ad 387, seu 9 ad 5 quom proxime. Est igitur corpus Lunæ densius ac magis terrestre quam Terra nostra*, p. 466.

Now if the Moon be more solid than the Earth, as 9 to 5, why may we not reasonably suppose the Moon, being a small Body, and a secondary Planet, to be solid Earth, Water and Stone, and this Globe to consist of the same Materials, only $\frac{2}{3}$ thereof to be Cavity, within and between the internal Spheres; which might be rendred not improbable.

And one of the Uses of the Cavity of the Earth seems to be, To diminish the Specifick Gravity thereof, in respect of the Moon; for it may be demonstrated, that the Opposition of the *Ether* to the Motions of the Planets, in a long time, becomes sensible; and consequently, the greater Bodies must receive a less Opposition than the smaller, unless the Specifick Gravity of the smaller do proportionably exceed that of the greater, in which Case only they can move together; so that the Cavity assign'd in the Earth, may serve well to adjust its Weight to that of the Moon: For otherwise, the Earth would leave the Moon behind it, and the become another primary Planet.

VARICOSUM Corpus, is that Contexture of Spermatick Vessels, which enters the Testicles.

VARIOLÆ, the Small-Pox, consists in a contagious Disorder of the Blood, contracted from the Air or otherwise; accompanied with a continued wandering Fever, which sometimes increaseth, sometimes decreases, with a Pain in the Head and Loins, Anxiety and Inquietude, and with a breaking forth of Pimples and Wheals, which swell and suppurate. The Famous *Willis* attributes the Cause of this Distemper to some filthy and fermentative Matter, which is communicated to the *Fætus*, together with the Nourishment from the Womb; but how this can hold in adult Persons, whose Blood has undergone so many Alterations, I could never yet understand from his Writings. It seems rather to consist in a depraved Temperature of Air, with a peculiar Disposition of the Blood and the nervous Juice towards this Distemper. This poisonous Quality of the Air, first infects the nervous Juice, (whence proceeds the Pain of the Head and Loins) wherewith the Blood boils and ferments, and parts into little Pieces or Clots, which in the Course of Circulation, stick to the outward Parts, and to the inner *Viscera* too; after a while they grow ripe, and suppurate. *Blanchard*.

VARIX: See *Cirsus*.

VASA brevia: See *Breve vas*.

VASA, the Vessels in an Animal, are Cavities through which the Liquors of the Body pass, as a Vein, an Artery, Lymphatick Vessels, the *Ductus* that conveys the Chyle, and those of the Spittle.

VASA deferentia, are those Vessels wherein the Seed is convey'd from the Testicles to the *Vesicula Seminales*.

VASA Lactea, the Milky Vessels in the Mesentery: They which reach from the Guts to the Glandules in the Mesentery, are said to be of the first sort; and they which reach from those Glandules to the Bag that carries the Chyle, are of the second sort.

Their Use is to convey the Chyle from the Guts to the little Bag which holds the Chyle, and thence to the *Ductus*, which conveys it to the *Thorax*. *Asellius* was the first who discovered them, and the dexterous *F. Ruyschius* afterwards discover'd Valves in them. *Blanchard*.

VASA Lymphaticæ: See *Vena Lymphatica*.

VASCULIFEROUS Planets, are, according to the Botanists, such as have besides the common Calyx or Flower-Cup, a peculiar Vessel or Case to contain their Seed, one belonging to each Flower, but sometimes divided into distinct Cells. These have always a monopetalous Flower, either uniform or difform.

The former of these have their Seeds all divided.

1. Into two Partitions; as the *Hyoscyamus*, *Nicotiana*, *Priapeia*, and the *Gentiana*.

2. Into three Partitions; as the *Convolvulus*, *Speculum Veneris*, *Trachelium*, *Repunculus*, *Campanula*, *Repunculus Corniculatus*, &c.

3. Into four Partitions; as the *Stramonium*.

Those of the latter Kind, or which have a difform monopetalous Flower, as the *Linaria*, *Pinguicula*, *Antirrhinum*, *Aristolochia*, *Scrophularia*, *Digitalis*, *Pedicularis*, *Melampyrum* and *Euphrasia*, &c.

VASTI Musculi, are certain Muscles that contribute to the extending of the Leg, and are of two sorts, viz. *External* and *Internal*.

VASTO, is a Writ that lies for the Heir against the Tenant for Term of Life, or of Years, for making Waste, or for him in the Reversion or Remainder.

VASTUM, is a Waste or Common, lying open to the Cattle of all Tenants, who have a Right of Commoning.

VASTUS Externus, is a Muscle of the Leg, so called, from its Magnitude and Situation. It arises outwardly tendinous, inwardly fleshy from the external Part of the great *Trochanter*, and *Linea Aspera* of the Thigh-bone, from whence its Fibres descend obliquely forwards; and on the contrary, become outwardly fleshy, and tendinous internally; and so soon as they meet with the Tendon of the *Rectus Femoris*, grow perfectly tendinous. It helps to extend the *Tibia*.

VASTUS Internus, is a Muscle of the Leg, which hath its Denomination from its Situation and Magnitude. Its Beginning is large, partly tendinous, and partly fleshy; its being continued from the *Linea Aspera*, on the Back-part of the Thigh-bone, from immediately below the lesser *Trochanter*, till within three Fingers breadth above the inferior *Appendix* of the said Bone internally and laterally; from hence its fleshy Fibres descend obliquely outwards, and an almost semicircular manner, and on a sudden ceasing to be fleshy, its Tendon is united with that of the *Rectus*, together with the *Vastus Internus* and *Crureus*, and is inserted with them. It helps to extend the *Tibia*.

VECTIS, or the *Lever*, is the first of the Mechanick Powers, as they are usually call'd. This Dr. *Wallis*, in his *Mechanicks*, rightly considers as a *Right Line* perfectly inflexible, of no weight it self, or at least, of an equable one throughout, accommodated to the raising or sustaining of heavy Bodies. This *Vectis* is always supported by a *Fulcrum*, on which it moves as on an immoveable Centre.

VECTOR, a Line suppos'd to be drawn from any Planet moving round a Centre, as the Focus of an Ellipsis, to that Centre or Focus, is by some Writers of the New Astronomy, call'd the *Vector*; because 'tis that Line by which the Planet seems to be carried round its Centre, and with which it describes proportional Area's in proportional Time.

VEDETTE, a Military Term, signifying a Centinel on Horse-back detach'd from the Main Body of the Army, to discover and give notice of the Enemies Designs.

VEER: The Seamen call *Veering* out a Rope, letting it go by Hand, or letting it run out of it self. Thus they say, *Veer more Cable*; that is, let more Cable run out. But they don't use this Word for the letting out of any running Rope, except the *Sheat*, but of that, they say, *Veer more Sheat*; that is, let more of it run out.

The Word *Veer* is also used in reference to the Wind; for when it changeth often and suddenly, they say, the Wind *veereth*; also when a Ship being under Sail, hath her *Sheat* veered out, they say, she goes *Veering*; that is, at large; neither by a Wind, nor directly before it, but between both, which they call also *Quartering*.

VEGETABLES, are such Natural Bodies as grow and increase from Parts organically form'd, but have no proper Life nor Sensation.

VEGE-

VEGETATION, is the Way of Growth or Increase of Bulk, Parts and Dimensions, proper to all Trees, Shrubs, Plants, and Herbs.

It hath been a general Opinion amongst almost all the Modern Naturalists; That the Vegetation of Plants and even Minerals too, was chiefly owing to Water; and that not only as a Vehicle, to convey to them the fine rich Earth, &c. proper for their Nourishment; but that the Water was transmuted into the very Body of the Plant, and afforded the greatest part of it, if not all the Matter with which they are nourish'd, and by which they grow and increase in Bigness. This Opinion countenanced by very great Names, that Learned and Ingenious Naturalist Dr. John Woodward, Author of the *Natural History of the Earth*, thought very well worth taking into serious Examination.

And in the first place, he carefully examined all sorts of Water, and found, that the clearest, finest Spring-water, which he could any where meet with, exhibited even to the naked Eye, great Numbers of exceeding small terrestrial Particles, and that all other Crasser Waters had these in yet much greater Quantity; and also, that they were of a much larger Bulk.

He found this Terrestrial Matter, contain'd in all Water, to be of two kinds: The one properly a *Vegetable Matter*, but consisting of very different Particles; some of which are proper for the Nourishment of some kinds of Plants; others for different sorts, &c. The other kind of Earthy Matter, he found to be purely of a Mineral Nature; and this also was of very various and different kinds.

The former sort of Vegetable Earthy Matter, abounds plentifully in all Waters; but for the Mineral, 'tis found mostly in Spring-water, next to that, in River-water, and least of all in Rain-water; tho' even there it is also to be found plentifully.

This Fact (he saith) any one may discover, by only keeping Water for a competent Time without stirring it, in a clear Glass Viol, close stopp'd, to keep out Dust, &c. For then he will observe, that these very small Terrestrial Particles, which before were scarcely visible singly, will now combine together into larger and more conspicuous Masses, which, by Degrees, will join together, and form Clouds as it were in the Water, which will grow daily more and more opacous and thick, by the continual Accession of new Matter. And if the Earthy Matter in the Water be chiefly of the *Vegetable* kind, it will turn the Water green, the usual Colour of Vegetables; and this will grow deeper and deeper colour'd, but will not precipitate to the Bottom of the Glass, as the *Mineral* Matter will, if there be any considerable Quantity, by reason of its much greater Specifick Gravity. On the whole therefore he concludes, very justly, That there is in all Water a considerable Quantity

of Earthy Matter. And in order to determine whether the Vegetation of Plants was chiefly owing to bare Water, or not rather to the *Terrestrial Matter* therein contain'd, he made, with very great Accuracy and Care, the following Experiments, as you will find in a Discourse of his, read before the Royal Society, and publish'd in their *Transactions*, N. 253.

Which *Experiments*, because they are done with an uncommon Care and Exactness, are a sufficient number of them, and are follow'd by very ingenious *Reflections*, serving to explicate many Difficulties in Philosophy, and to set the whole Affair of Vegetation in a very good Light; I shall give the Reader as followeth.

A. D. 1691, I chose (saith he) several *Glass Viols*, that were all, as near as possible, of the same shape and bigness. After I had put what Water I thought fit into every one of them, and taken an Account of the *Weight* of it, I strain'd and ry'd over the Orifice of each Viol, a piece of Parchment, having an Hole in the Middle of it, large enough to admit the *Stem* of the *Plant* I design'd to set in the Viol, without confining or straitning it, so as to impede its *Growth*. My Intention in this, was to prevent the enclosed Water from evaporating or ascending any other way, than only through the Plant to be set therein.

Then I made choice of several Sprigs of *Mint*, and other *Plants* that were, as near as I could possibly judge, alike fresh, sound and lively. Having taken the *Weight* of each, I plac'd it in a Viol order'd as above; and as the Plant imbibed and drew off the Water, I took care to add more of the same from time to time, keeping an Account of the *Weight* of all I added. Each of the Glasses were for better Distinction, and the more easy keeping a Register of all the Circumstances, noted with a different Mark or Letter, A, B, C, &c. and all set in a row in the same Window, in such manner, that all might partake alike of *Air*, *Light*, and *Sun*. Thus they continued from *July* the 20th to *October* the 5th, which was just 77 Days. Then I took them out, weigh'd the Water in each Viol, and the Plant likewise, adding to its *Weight* that of all the Leaves that had fallen off during the Time it stood thus. And lastly, I computed how much each Plant had gain'd, and how much Water was spent upon it. The Particulars are as follows.

A: *Common Spear-Mint*, set in *Spring-water*.

The Plant weigh'd, when put in *July* 20, just 27 Grains; when taken out *October* 5. 42 Gr. So that in this Space of 77 Days; it had gain'd in *Weight* 15 Grains.

The whole Quantity of Water expended during the 77 Days, amounts to 2558 Gr. Consequently, the *Weight* of the Water taken up, was $170\frac{4}{17}$ times as much as the Plant had got in *Weight*.

A. Common Spear-Mint : Spring-Water.

Weight of the Plant when first put in Water.	Weight of the Plant when taken out of the Water.	Weight gained by the Plant during the 77 Days.	Weight of the Water expended upon the Plant.	Proportion of the Increase of the Plant to the Expence of the Water.
27 Grains.	42 Grains.	15 Grains.	2558 Grains.	As 1 to $170\frac{2}{3}$.

B. Common Spear-Mint : Rain-Water.

28 $\frac{1}{2}$ Gr.	45 $\frac{3}{4}$ Gr.	17 $\frac{1}{2}$ Gr.	3004 Gr.	As 1 to $171\frac{2}{3}$.
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C. Common Spear-Mint : Thames-Water.

28 Gr.	54 Gr.	26 Gr.	2493 Gr.	As 1 to $95\frac{2}{3}$.
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D. Common Solanum, or Night-Shade : Spring-Water.

49 Gr.	106 Gr.	57 Gr.	3708 Gr.	As 1 to $65\frac{3}{4}$.
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E. Lathyrus seu Cataputia Gерб. Spring-Water.

98 Gr.	101 $\frac{1}{2}$ Gr.	3 $\frac{1}{2}$ Gr.	2501 Gr.	As 1 to $714\frac{4}{7}$.
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The Specimen D had several Buds upon it when first set in Water ; these in some Days became fair Flowers, which were at length succeeded by Berries. Several other Plants were try'd, that did not thrive in Water, or succeed any better than the Cataputia foregoing.

The Viols F and G were filled, the former with Rain, and the other with Spring-Water, -at the same time as those above-mention'd were, and stood as long as they did ; but they had neither of them any Plant ; my Design in these being only to inform my self, whether any Water exhaled out of the Glasses, otherwise than through the Bodies of the Plants. The Orifices of these two Glasses were cover'd with Parchment ; each piece of it being perforated with an Hole of the same bigness with those of the Viols above : In this I suspended a bit of Stick about the thickness of the Stem of one of the aforefaid Plants, but not reaching down to the Surface of the included Water ; I put them in thus, that the Water in these might not have more scope to evaporate than that in the other Viols.

Thus they stood the whole 77 Days in the same Window with the rest ; when, upon Examination, I found none of the Water in these wasted or gone off : Though I observed, both in these, and the rest, especially after hot Weather, small Drops of Water, not unlike Dew, adhering to the insides of the Glasses ; that part of them I mean, that was above the Surface of the enclosed Waters.

The Water in these two Glasses that had no Plants in them, at the End of the Experiment, exhibited a larger Quantity of Terrestrial Matter than that in any of those that had the Plants in them did. The Sediment in the Bottom of the Viols was greater, and the Nubecula diffused thro' the Body of the Water thicker. And of that which was in the others, some of it proceeded from certain small Leaves that had fallen from that part of the Stems of the Plants that was within the Water, wherein they rotted and dissolved. The Terrestrial Matter in the Rain-Water, was finer than that in the Spring-Water.

Experiments, Anno 1692.

The Glasses made use of in this, were of the same sort with those of the former Experiment; and cover'd over with Parchment in like manner.

The Plants here were all *Spear-Mint*; the most kindly, fresh, sprightly Shoots I could chuse. The Water and the Plants were weigh'd as above, and the Viols set in a Line, in a *South Window*, where they stood from *June* the 2d, to *July* the 28th; which was just 56 Days.

H. Hyde-Park Conduit Water, alone.				
The Weight of the Plant when first set in Water.	Weight of the Plant when taken out of the Water.	What gain'd by the Plant during the 56 Days.	What of the Water is expended upon the Plant.	Proportion of the Increase of the Plant to the Expence of the Water.
127 Grains.	255 Grains.	128 Grains.	14190 Grains.	As 1 to 110 $\frac{71}{12}$.
I. The same Water, alone.				
110 Gr.	249 Gr.	139 Gr.	13140 Gr.	As 1 to 94 $\frac{74}{133}$.
K. The same Water, with an Ounce and an half of common Garden Earth dissolved in it.				
76 Gr.	244 Gr.	168 Gr.	10731 Gr.	As 1 to 63 $\frac{147}{106}$.
L. Hyde-Park Water, with the same Quantity of Garden Mould as the former.				
92 Gr.	376 Gr.	284 Gr.	14950 Gr.	As 1 to 52 $\frac{182}{284}$.
M. Hyde-Park Water, distilled with a gentle Still.				
114 Gr.	155 Gr.	41 Gr.	8803 Gr.	As 1 to 21 $\frac{439}{21}$.
N. The Residue of the Water which remain'd in the Still after that in M was distill'd off.				
81 Gr.	176 Gr.	94 Gr.	4344 Gr.	As 1 to 46 $\frac{20}{94}$.

H, was all along a very kindly Plant, and had run up above two Foot in height. It had shot but one considerable collateral Branch; but had sent forth many and long Roots; from which sprung very numerous, tho' small and short lesser Fibrils. These lesser Roots came out of the larger on two opposite sides, for the most part; so that each Root, with its Fibrilla, appeareth not unlike a small Feather. To these Fibrillæ adhered pretty much Terrestrial Matter. In the Water which was at the last thick and turbid, was a green Substance, resembling a fine thin *Conserva*.

The Plant I, was as kindly as the former, but had shot no collateral Branches: Its Roots, the Waters, and the green Substance, all much as in the former.

The Plant K, tho' it had the Misfortune to be annoy'd with very small Insects that happen'd to fix upon it, yet had shot very considerable collateral Branches; and at least as many Roots, as either in H or I, which had a much greater Quantity of Terrestrial Matter adhering to the Extremities of them. The same green Substance here that was in the two preceding.

The Plant L, was far more flourishing than any of the precedent; had several considerable collateral Branches, and very numerous Roots, to which Terrestrial Matter adhered very copiously.

The Earth in both these Glasses was very sensibly and considerably wasted, and less than when first put in. The same sort of green Substance here, as in those above.

The Plant M, was pretty kindly; had two small collateral Branches, and several Roots, tho' not so many as that in H or I; but as much Terrestrial Matter adhering to them, as those had. The Water was pretty thick; having very numerous small Terrestrial Particles swimming in it, and some Sediment at the bottom of the Glass. This Glass had none of the green Matter above-mentioned in it.

The Plant N, was very lively, and had sent out six collateral Branches, and several Roots.

The Glass O, had also Hyde Park Conduit Water, in which was dissolv'd a Dram of Nitre. The Mint set in this, suddenly began to wither and decay, and died in a few days, as likewise did two more Sprigs that were set in it successively. In another Glass I dissolv'd an Ounce of good Garden Mould, and a Dram of Nitre; and in a third, half an Ounce of Wood-ashes, and a Dram of Nitre; but the Plants in these succeeded no better than in the former. In other Glasses I dissolv'd several other sorts of Earth, Clay, Marls, and variety of Manures, &c. I set Mint in distilled Mint-Water; and other Experiments I made of several

several Kinds, in order to get Light and Information what hastned or retarded, promoted or impeded *Vegetation*.

The *Glass P, Hyde-Park Conduit Water*: In this I fixed a *Glass-Tube* of ten Inches long, the Bore about one sixth of an Inch in Diameter, filled with very fine and white Sand, which I kept from falling down out of the Tube into the Viol, by tying a thin Piece of Silk over that end of the Tube that was downwards. Upon Immersion of the lower End of it into the Water; this by little and little ascended quite to the upper Orifice of the Tube; and yet in all the 56 Days which it stood thus, a very inconsiderable Quantity of Water had gone off, viz, scarcely 20 Grains, tho' the Sand continued moist up to the top, 'till the very last. The Water had imparted a green Tincture to the Sand, quite to the very top of the Tube: And in the Viol, it hath precipitated a greenish Sediment, mix'd with Black. To the Bottom and Sides of the Tube, as far as 'twas immersed in the Water, adhered pretty much of the green Substance described above. Other-like Tubes I filled with *Cotton, Lint, Pith of Elder*, and several other porous *Vegetable Substances*; setting some of them in clear Water, others in Water tinged with *Saffron, Cochinele, &c.* And several other Trials were made, in order to give a Mechanical Representation of the Motion and Distribution of the Juices in Plants; and of some other *Phænomena* observable in *Vegetation*.

Several *Plants* being also set in the Vials *Q, R, S, &c.* ordered in like manner as those above, in *October*, and the following colder Months; these thrived not near so much, nor did the Water ascend in nigh the Quantity it did in the hotter Seasons, in which the before cited Trials were made.

Some Reflections upon the foregoing Experiments.

1. In the *Plants* of the same kind, the less they are in Bulk, the smaller Quantity of the Fluid Mass in which they are set, is drawn off; the Dispensium of it where the Mass is of equal Thickness, being pretty nearly proportion'd to the Bulk of the Plant.

Thus, that in the Glass mark'd A, which weigh'd only 27 Gr. drew off but 2538 Gr. of the Fluid: And that in B, which weigh'd only 28 $\frac{1}{4}$ took up but 3004 Gr. Whereas that in H, which weigh'd 127 Gr. spent 14190 Gr. of the *Liquid Mass*.

The Water seems to ascend up the Vessels of Plants, in much the same manner as up a *Filter*; and 'tis no great Wonder, that the larger *Filter* should draw off more Water, than the lesser; or that a Plant that has more and larger Vessels, should take up a greater share of the Fluid in which it is set, than one that has fewer and smaller ones can. Nor do I note this as a Thing very considerable in it self, but chiefly in regard to what I am about next to offer: And that it may be seen, that in my other Collations of Things, I made due Allowance for this Difference.

2. The much greater part of the Fluid Mass that is thus drawn off, and convey'd into the Plant, does not settle or abide there; but passes through the Pores of them, and exhales up into the Atmosphere.

That the Water in these Experiments ascended only through the Vessels of these Plants, is certain.

The *Glasses F and G*, that had no Plants in them, tho' disposed in like manner as the rest, remain'd at the end of the Experiment, as at first, and none of the Water was gone off: And that the greatest part of it flies off from the Plant into the Atmosphere, is as certain.

The least Proportion of the Water expended, was to the Augment of the Plant, as 46 or 50 to 1. And in some, the Weight of the Water drawn off was 100, 200, nay, in one above 700 times as much as the Plant had received of Addition.

This so continual an Emission and Detachment of Water, in so great Plenty, from the Parts of the Plants, affords us a manifest Reason, why Countries that abound with Trees, and the larger Vegetables especially, should be very obnoxious to *Damps*, great Humidity in the Air, and more frequent Rains, than others that are more open and free. The great Moisture in the Air, was a mighty Inconvenience and Annoyance to those who first settled in *America*, which at that Time was much overgrown with Woods and Groves. But as these were burnt and destroy'd, to make way for Habitations and Culture of the Earth, the Air mended and cleared up apace, changing into a Temper much more serene and dry than before. Nor does this Humidity go off pure and alone, but usually bears forth with it many Parts of the same Nature with those whereof the Plant, through which it passes, consists. The *Craffer* indeed are not so easily born up into the Atmosphere; but are usually deposited on the Surface of *Leaves, Flowers*, and other Parts of the Plants. Hence come our *Manna's*, our *Honies*, and other Gummy Exudations of Vegetables.

But the finer and lighter Parts are with greater ease sent up into the Atmosphere.

Thence they are convey'd to our Organs of Smell, by the Air we draw in *Respiration*, and are pleasant or offensive, beneficent or injurious to us, according to the Nature of the Plants from whence they arise.

And since these owe their Rise to the Water that ascends out of the Earth through the Bodies of Plants, we cannot be far to seek for the Cause why they are more numerous in the Air, and we find a greater Quantity of Odours exhaling from Vegetables, in warm, humid Seasons, than in any others whatsoever.

3. A great part of the Terrestrial Matter that is mix'd with Water, ascends up into the Plant, as well as the Water.

There was much more Terrestrial Matter at the end of the Experiment in the Water of the *Glasses F and G*, that had no Plants in them, than in those that had Plants.

The Garden Mould dissolved in the *Glasses K and L*, was considerably diminished, and carried off; nay, the Terrestrial and Vegetable Matter

was born up in the Tubes fill'd with Sand, Cotton, &c. in that Quantity, as to be evident even to Sense. And the Bodies in the Cavities of the other Tubes, that had their lower Ends immers'd in Water, wherein *Saffron*, *Cochineel*, &c. had been infused, were tinged with Yellow, Purple, &c.

If I may be permitted to look abroad a while, towards our *Shores* and *Parts* within the *Verge* of the *Sea*, these will present us with a large Scene of *Plants*, that along with the *Vegetable*, take up into them meer *Mineral Matter* also in great abundance: Such are our *Sea Purslain*, the several sorts of *Alga's*, of *Samphires*, and other *Marine Plants*. Those contain common *Sea Salts*, which is all one with the *Fossil*, in such Plenty, as not only to be plainly distinguish'd on the *Palate*, but may be drawn forth of them in considerable Quantity; nay, there want not those, who affirm, There are *Plants* found that will yield *Nitre*, and other *Mineral Salts*; of which, indeed, I am not so far satisfied, that I can depend on the thing, and therefore give this only as an *Hint* for Enquiry.

To go on with the *Vegetable Matter*, how apt, and how much dispos'd this, being so very fine and light, is to attend Water in all its *Motions*, and follow it into each of its *Recesses*, its manifest, not only from the Instances above alledged, but many others. *Percolate* it with all the Care imaginable, *Filter* it with never so many *Filtrations*, yet some *Terrestrial Matter* will remain. 'Tis true, the Fluid will be thinner every time than other, and more disengaged of the said Matter; but never wholly free and clear. I have filter'd Water thro' several Sheets of thick Paper, and after that thro' very close fine Cloth twelve times doubled; nay, have done this over and over, and yet a considerable Quantity of this Matter discovered it self in the Water after all. Now, if it thus passes *Interstices* that are so very small and fine along with the Water, 'tis the less strange it should attend it in its Passage through the *Ducts* and *Vessels* of *Plants*. 'Tis true, filtering and distilling of Water, intercepts and makes it quit some of the Earthy Matter it was before impregnated withal; but then, that which continues with the Water after this, is fine and light, and such consequently as is in a peculiar manner fit for the Growth and Nourishment of *Vegetables*. And this is the case of *Rain-water*. The Quantity of *Terrestrial Matter* it bears up into the *Atmosphere* is not great: But that which it does bear up, is mainly of that light kind or *Vegetable Matter*, and that too perfectly dissolved, and reduced to single *Corpuscles*, all fit to enter the *Tubules* and *Vessels* of *Plants*. On which account 'tis, that this Water is so very *Fertile* and *Profitick*.

The Reason why in this *Proposition* I say only a great Part of the *Terrestrial Matter* that is mix'd with the Water, ascends up with it into the Plant is, because all of it cannot. The *Mineral Matter* is a great deal of it, not only gross and ponderous, but scabrous and inflexible; and so not disposed to enter the *Pores* of the *Roots*. And a great many of the simple *Vegetable Particles* by Degrees unite, and form some of them small *Clods* or *Molecules*; such as those mention'd in H, K, and L, sticking to the Extremities of the *Roots* of those *Plants*. Others of 'em intangled in a looser manner, and form the *Nubecula*, and green Bodies so commonly

observed in stagnant Water. These, when thus conjoin'd, are too big to enter the *Pores*, or ascend up the *Vessels* of *Plants*, which singly they might have done.

They who are conversant in *Agriculture*, will easily subscribe to this. They are well aware, that be their *Earth* never so rich, so good, and so fit for the Production of *Corn* or other *Vegetables*, little will come of it, unless the *Parts* of it be separated and loose. 'Tis on this account they bestow the Pains they do in *Culture* of it; in *Digging*, *Plowing*, *Harrowing*, and breaking of the clodded *Lumps* of *Earth*. 'Tis the same way that *Sea Salt*, *Nitre*, and other *Salts* promote *Vegetation*.

I am sorry I cannot subscribe to the Opinion of those *Learned Gentlemen*, who imagine *Nitre* too essential to *Plants*; and that nothing in the *Vegetable Kingdom* is transacted without it. By all the *Trials* I have been able to make, the thing is quite otherwise; and when contiguous to the Plant, it rather destroys, than nourishes it. But this *Nitre* and other *Salts* certainly do; they loosen the *Earth* and separate the concreted *Parts* of it, by that means fitting and disposing them to be assumed by the Water, and carried up into *Seed* or *Plant*, for its *Formation* and *Augment*.

There is no Man but must observe, how apt all sorts of *Salts* are to be wrought upon by *Moissture*; how easily they lique and run with it; and when these are drawn off, and have deserted the *Lumps* wherewith they were incorporated, those must moulder immediately, and fall asunder of course. The hardest *Stone* we meet with, if it happen, as frequently it does, to have any sort of *Salt* intermix'd with the *Sand*, of which it consists, upon being expos'd to an humid *Air*, in a short time dissolves and crumbles all to Pieces, and much more will clodded *Earth* or *Clay*, which is not of near so compact and so solid a Constitution as *Stone* is. The same way likewise is *Lime* serviceable in this Affair. The *Husbandman* says of it, That it does not fatten, but only mellows *Ground*. By which they mean, That it does not contain any thing in it self that is of the same Nature with the *Vegetable Mould*, or afford any Matter fit for the Formation of *Plants*, but merely softens and relaxes the *Earth*, by that means rendering it more capable of entering the *Seeds* and *Vegetables* set in it, in order to their Nourishment, than otherwise it would have been. The Properties of *Lime* are well known, and how apt 'tis to be put into *Ferment* and *Commotion* by *Water*: Nor can such *Commotion* ever happen when *Lime* is mixed with *Earth*, however hard or clodded that may be, without opening and loosening of it.

4. The Plant is more or less nourished and augmented in Proportion, as the Water in which it stands contains a greater or smaller Quantity of proper *Terrestrial Matter* in it.

The Truth of this *Proposition* is so evidently discernable through the whole Process of these *Trials*, that I think no doubt can be made of it.

The *Mint* in the *Gla's C*, was of much the same Bulk and Weight with those in A and B: But the Water in which that was, being *River Water*, which was apparently stored more copiously with *Terrestrial Matter*, than the *Spring* or *Rain Water* wherein they stood, were; it had thriven at almost

almost double the Bulk that either of them had, and with a less Expence of Water too. So likewise, the *Mint* in L, in whose Water was dissolved a small Quantity of good Garden Mould, tho' it had the Disadvantage to be less when first set, than either of the *Mints* in H or I, whose Water was the very same with that in L, but had none of that Earth mixed with it, yet in a short time, the Plant not only overtook, but much outstript those; and at the end of the Experiment, was very considerably bigger and heavier than either of them.

In like manner, the *Mint* in N, tho' less in the beginning than that in M, being set in that *thick, turbid, ferulent Water* that remained behind, after that wherein M was placed was stilled off, had in fine more than double its original Weight and Bulk; and received above twice the additional Encrease that that in M, which stood in thinner distilled Water, had done: And which is not less considerable, had not drawn off half the Quantity of Water that that had.

Why, in the beginning of this Article, I limit the Proportion of the Augment of the *Plant*, to the Quantity of the proper Terrestrial Matter in the Water, is, Because all, even the *Vegetable Matter*, to say nothing of the *Mineral*, is not proper for the Nourishment of every *Plant*.

There may be, and doubtless are, some Parts in different Species of *Plants*, that may be much alike, and so owe their Supply to the same common Matter: But 'tis plain, all cannot. And there are other Parts so differing, that 'tis no ways credible they should be formed all out of the same sort of *Corpuscles*: So far from it, that there want not good Indications, as we shall see by and by, That every kind of *Vegetable* requires a peculiar and specific Matter for its Formation and Nourishment; yea, each part of the same *Vegetable* does so; and there are very many and different Ingredients go to the Composition of the same individual Plant.

If therefore the Soil, wherein any *Vegetable* or Seed is planted, contains all or most of these Ingredients, and those in due Quantity, 'twill grow and thrive there; otherwise 'twill not. If there be not as many sort of *Corpuscles*, as are requisite for the Constitution of the main and more essential Parts of the Plant, 'twill not prosper at all. If there be these, and not in sufficient Plenty, 'twill starve, and never arrive to its natural Stature. Or if there be any the less necessary and essential *Corpuscles* wanting, there will be some Failure in the Plant; 'twill be defective in Taste, in Smell, in Colour, or some other way.

But tho' the Tract of Land may happen not to contain proper Nourishment for the Constitution of some one peculiar kind of *Plant*; yet it may for several others, and those much differing amongst themselves.

The *Vegetable Particles* are commixt and blended in the Earth, with all the Diversity and Variety, as well as all the Uncertainty conceivable. (I have given some Intimations of this in *Nat. Hist. of the Earth*, Page 268, &c. and shall not repeat them here.)

It is not impossible to imagine, how, one, uniform, homogeneous Matter, having its Principles or original Parts all of the same Substance, Constitution, Magnitude, Figure, and Gravity, should ever constitute Bodies so egregiously unlike, in all those respects, as *Vegetables* of different kinds are; nay, even as

the different Parts of the same *Vegetable*: That one should carry a *Resinous*, another a *Milky*; a third a *Yellow*, a fourth a *Red Juice* in its Veins; one afford a *fragrant*, another an *offensive Smell*; one be *sweet* to the Taste, another *bitter*, *acid*, *acerb*, *austere*, &c. That one should be *nourishing*, another *poisonous*, one *purging*, another *astringent*, That there should be that vast difference in them; in their several *Constitutions*, *Makes*, *Properties*, and *Effects*, and yet all arise from the very same sort of *Matter*, would be very strange. And, to Note that by the Bye, this Argument makes equally strong against those who suppose mere *Water* the *Matter* out of which all *Bodies* are formed.

The *Cataputia*, in the Glas E received but very little Encrease, only three Grains and an half all the while it stood, tho' 2501 Gr. of *Water* were spent upon it. I will not say the reason was, Because the *Water* did not contain in it *Matter* fit and proper for the Nourishment of that peculiar and remarkable *Plant*. No, it may be, the *Water* was not a proper *Medium* for it to grow in: And we know, there are very many *Plants* that will not thrive in it.

Too much of that *Liquor*, in some *Plants*, may probably hurry the Terrestrial Matter thro' their Vessels too fast for them to arrest and lay hold of it. Be that as it will, 'tis most certain, There are peculiar Soils that suit particular *Plants*.

In *England*, *Cherries* are observ'd to succeed best in *Kent*; *Apples* in *Heresfordshire*; *Saffron* in *Cambridgeshire*; *Wood* in two or three of our *Midland Counties*; and *Teazles* in *Somerseeshire*. This is an Observation that hath held in all *Parts*, and indeed in all *Ages* of the *World*. The most ancient Writers of *Husbandry* took Notice of it; and are not wanting in their *Rules*, for making choice of *Soils* suited to the *Nature* of each kind of *Vegetable* they thought valuable or worth Propagating.

But, which is a further Proof of what I am here endeavouring to advance, That Soil that is once proper and fit for Production of some one sort of *Vegetable*, does not ever continue to be so. No, in Tract of Time, it loses that Property; but sooner in some *Lands*, and later in Others. This is what all, who are conversant in these Things, know very well.

If *Wheat*, for Example, be sown upon a Tract of Land that is proper for that *Grain*, the first Crop will succeed very well, and perhaps the second, and the third, as long as the Ground is in *Heart*, as the *Farmers* speak: But in a few Years 'twill produce no more, if sowed with that *Corn*. Some other *Grain* indeed it may, as *Barley*. And after this has been sown so often, that the *Land* can bring forth no more of the same, it may afterwards yield some good *Oats*, and perhaps *Pease* after them: At length it will become barren; the *Vegetative Matter* that at first it abounded withal, being reduced forth of it by those successive Crops, and most of it born off. Each sort of *Grain* takes forth that peculiar *Matter* that is proper for its own Nourishment. First the *Wheat* draws off those Particles that suit the Body of that *Plant*, the rest lying all quiet and undisturb'd the while. And when the *Earth* has yielded up all them, those that are proper for *Barley*, a different *Grain*, remain still behind, 'till the successive Crops of that *Corn* fetch them forth too: And so the *Oats* and *Pease* in their Turn, 'till in fine all is carried off, and the

Earth in a great Measure drained of that sort of Matter.

After all which, that very Tract of Land may be brought to produce another *Series* of the same *Vegetables*, but never till 'tis supplied with a new *Fund* of Matter of the like sort with that it at first contained. This Supply is made several ways: By the Ground's lying Fallow for some time, till the Rain has poured down a fresh Stock upon it: Or by the Tiller's Care, in Manuring of it. And for further Evidence that this Supply is in reality of like sort, we need only reflect a while upon those *Manures* that are found by constant Experience best to promote *Vegetation*, and the *Fruitfulness* of the Earth. These are chiefly either *Parts* of *Vegetables*, or of *Animals*, which indeed either derive their own Nourishment immediately from *Vegetable* Bodies, or from other *Animals* that do so. In particular, the *Blood*, *Urine*, and *Excrements* of *Animals*; *Shaving* of *Horns*, and of *Hoofs*; *Hair*, *Wool*, *Feathers*, *calcined Shells*, *Lees* of *Wine*, and of *Beer*, *Ashes* of all sorts of *Vegetable Bodies*, *Leaves*, *Straw*, *Roots*, and *Stubble* turned into *Earth*, by plowing or otherwise, to rot and dissolve there. These, I say, are our best *Manures*; and being *Vegetable* Substances when refunded back again into the Earth, serve for the Formation of other like Bodies.

Nor wholly to confine our Thoughts to the *Fields*, let us look a while into our *Gardens*, where we shall meet with still further Confirmations of the same thing. The *Trees*, *Shrubs*, and *Herbs*, Cultivated in these, after they are continued in one *Station*, till they have derived thence the greater Part of the Matter fit for their *Augment*, will decay and degenerate, unless either fresh Earth, or some fit *Manure*, be applied unto them. 'Tis true, they may maintain themselves there for some time, by sending forth *Roots* further and further, to a great Extent all round, to fetch in more remote Provision: But at last, all will fail; and they must either have a fresh Supply brought to them, or they themselves be removed and transplanted to some Place better furnished with Matter for their Subsistence. And accordingly, *Gardeners* observe, That *Plants* that have stood a great while in a Place, have longer *Roots* than usual; part of which they cut off when they transplant to a fresh Soil, as now not of any further use to them.

All these Instances, to pass over a great many others that might be alledged, point forth a particular *Terrestrial Matter*, and not *Water*, for the Subject, to which *Plants* owe their Increase: Were it *Water* only, there would be no need of *Manures*, or of Transplanting them from place to place. The *Rain* falls in all places alike, in this *Field* and in that indifferently, in one side of an *Orchard* or *Garden* as well as another. Nor could there be any reason, why a Tract of Land should yield *Wheat* one Year, and not the next, since the *Rain* showers down alike in each. But I am sensible I have carried this Article to too great a length, which yet on so ample and extensive a Subject, 'twas not easie to avoid.

5. *Vegetables* are not formed of *Water*, but of a certain peculiar *Terrestrial Matter*.

It hath been shewn, That there is a considerable Quantity of this Matter contained both in *Rain*, *Spring*, and *River-water*; that the much greatest

part of the *Fluid Mass* that ascends up into *Plants*, does not settle or abide there, but passes through the *Pores* of them, and *Exhales* up into the *Atmosphere*; that a great part of the *Terrestrial Matter* mixed with the *Water*, passes up into the *Plant* along with it, and that the *Plant* is more or less augmented in proportion, as the *Water* contains a greater or smaller Quantity of that Matter. From all which we may very reasonably infer, That *Earth*, and not *Water*, is the Matter that constitutes *Vegetables*.

The *Plant* in *E* drew up into it 2501 Grains of the *Fluid Mass*, and yet had received but $3\frac{1}{2}$ Gr. of Encrease from all that.

The *Mint* in *L*, tho' it had at first the Disadvantage to be much less than that in *I*, yet being set in *Water*, wherewith *Earth* was plentifully mixed, and that in *I* only in *Water*, without any such additional *Earth*, it had vastly outgrown the other, weighing at last 145 Gr. more than that did, and so having gain'd above twice as much as the other had.

In like manner, that in *K*, tho' 'twas a great deal less when put in than that in *I*, and was also impair'd and offended by *Insects*, yet being planted in *Water* wherein *Earth* was dissolved, whereas the *Water* in which (*I*) stood, had none, it not only overtook, but considerably surpassed the other, weighing at last 29 Gr. more than that in *I*, and yet had not expended so much *Water* as that by above 2400 Gr.

The *Plant* in *N*, tho' at first a great deal less than that in *M*, yet being set in the foul crass *Water* that was left in the *Sill*, after that in which *M* was set, was drawn off, in conclusion, had gain'd in Weight above double what that in the finer and thinner *Water* had.

The Proportion of the Augment of that *Plant* that throve most, was to the *Fluid Mass* spent upon it, but as 1 to 46; in others, 'twas as 1 to 60, 100 to 200; nay, in the *Cataputia*, 'twas but as 1 to 714.

The *Mint* in *B* took up 39 Gr. of *Water* a day, one day with another; which was much more than the whole Weight of the *Plant* originally; and yet withal this, it gained not $\frac{1}{2}$ of a Grain a day, in Weight.

Nay, that in *H*, took up 253 Gr. a day of the *Fluid*, which was near twice as much as its original Weight, it weighing, when first set in the *Water*, but 127 Gr. And after all, the daily Encrease of the *Plant* was no more than $2\frac{1}{2}$ Gr.

6. *Spring* and *Rain-water* contain pretty near an equal Charge of *Vegetable Matter*; *River-water* more than either of them.

The *Plants* in the *Glasses* *A*, *B*, and *C*, were at first of much the same Size and Weight. At the end of the Experiment, the *Mint* in *A* had gain'd 15 Gr. out of 2558 Gr. of *Spring-water*: That in *B*, $17\frac{1}{2}$ Gr. out of 3004 Gr. of *Rain-water*; but that in *C* had got 26 Gr. out of only 2493 Gr. of *River-water*.

I do not found this Proposition solely upon those Trials, having made some more, which I do not relate here, that agree well enough with these: So that the Proportions here delivered, will hold for the main; but a strict and just Comparison is hardly to be expected; so far from it, that I make no doubt, but the *Water* that falls in *Rain*, at sometimes,

times, contains a greater Share of *Terrestrial Matter*, than that which falls at others. A more powerful and intense Heat must needs hurry up a larger Quantity of that Matter along with the humid Vapours, that form Rain, than one more feeble and remiss ever possibly can. The Water of one Spring may flow forth with an higher Charge of this Matter, than that of another; this depending partly upon the quickness of the *Ebullition* of the Water; and partly, upon the quantity of that Matter latent in the *Strata* through which the Fluid passes, and the greater or less Laxity of those *Strata*. For the same Reason, the Water of one River may abound with it more than that of another; nay, the same River, when much agitated and in *Commotion*, must bear up more of it, than when it moves with less *Rapidity* and *Violence*.

That there is a great quantity of this Matter in Rivers; and that it contributes vastly to the ordinary Fertility of the Earth, we have an illustrious Instance in the Nile, the Ganges, and other Rivers, that yearly overflow the neighbouring Plains. Their Banks shew the fairest and largest Crops of any in the whole World: They are even loaded with the multitude of their Productions; and those who have not seen them, will hardly be induced to believe the mighty Returns those *Tracts* make, in comparison of others, that have not the Benefit of like *Inundations*.

7. *Water serves only for a Vehicle to the Terrestrial Matter which forms Vegetables, and does not itself make any Addition unto them.*

Where the proper *Terrestrial Matter* is wanting, the Plant is not augmented, tho' never so much Water ascend into it.

The *Cataputia* in B, took up more Water than the *Mint* in C, and yet had grown but very little, having received only $3\frac{1}{2}$ Gr. of additional Weight, whereas the other had received no less than 26 Grains.

The *Mint* in I, was planted in the same sort of Water as that in K was; only the latter had Earth dissolved in Water, and yet that drew off 13140 Gr. of Water, gaining it self no more than 139 Gr. in Weight; whereas the other took up but 10731 Gr. of Water, and was augmented 168 Gr. in Weight; consequently, that spent 2409 Gr. more of the Water than this in K did, and yet was not so much encreased in Weight as this, by 29 Grains.

The *Mint* in M stood in the very same kind of Water, as that in N did. But the Water in M having much less *Terrestrial Matter* in it than that in N had, the Plant bore up 8803 Gr. of it, gaining it self only 41 Gr. the while; whereas that in N drew off no more than 4344 Gr. and yet was augmented 94 Gr. So that it spent 4459 Gr. of Water more than that did; and yet was not it self so much encreased in Weight as that was by 53 Gr.

This is both a very fair and a very conclusive Instance; on which account 'tis that I make often use of it. Indeed they are all so; and to add any thing further on this Head, will not be needful.

'Tis evident therefore, Water is not the Matter that composes Vegetable Bodies; 'tis only the Agent that conveys that Matter to them, that introduces and distributes it to their several Parts for their Nourishment. That Matter is sluggish and

inactive, and would lie eternally confined to its Beds of Earth, without ever advancing up into Plants, did not Water, or some like Instrument, fetch it forth, and carry it unto them.

That therefore there is that plentiful Provision and vast Abundance of it supplied to all Parts of the Earth, is a Mark of a *Natural Providence* Super-intending over the Globe we Inhabit, and Ordaining a due Dispensation of that Fluid, without the Ministry of which the noble Succession of Bodies we behold in *Animals*, *Vegetables*, and *Minerals*, should be all at a stand. But to keep to Plants; 'tis manifest, Water, as well upon this, as upon the other Hypothesis, is absolutely necessary in the Affair of *Vegetation*; and it will not succeed without it: Which indeed, gave occasion to the Opinion, That *Water* it self nourished, and was changed into Vegetable Bodies. They saw, That tho' these were planted in a Soil never so Rich, so Happy, so Advantageous, nothing came of it, unless there was *Water* too in considerable Quantity.

And it must be allow'd, *Vegetables* will not come on or prosper, where that is wanting. But yet what these Gentlemen inferred thence, was not, we see, well grounded.

This Fluid, is capacitated for the Office here assigned it, several ways. By the Figure of its Parts, which, as appears from many Experiments, is Exactly and Mathematically Spherical; their Surfaces being perfectly Polite, and without any the least Inequalities. 'Tis evident, Corpuscles of such a Figure are easily susceptible of Motion, yea, far above any others whatsoever; and consequently, the most capable of moving and conveying other Matter that is not so active and voluble. Then the Intervals of Bodies of that Figure are, with respect to their Bulk, of all others, the largest, and so the most fitting to receive and entertain foreign Matter in them. Besides, as far as the Trials hitherto made inform us, the constituent Corpuscles of Water, are each singly considered absolutely solid, and do not yield to the greatest external Force. This secures their Figure against any Alteration; and the Intervals of the Corpuscles must be always alike.

By the latter, 'twill be ever disposed to receive Matter into it: And by the former, when once received, to bear it along with it.

Water is further capacitated to be a Vehicle to this Matter, by the Tenuity and Fineness of the Corpuscles of which it consists. We hardly know any Fluid in all Nature, except Fire, whose Constituent Parts are so exceeding subtil and small, as those of Water are. They'll pass Pores and Interstices, that neither Air nor any other Fluid will. This enables them to enter the finest Tubes and Vessels of Plants, and to introduce the *Terrestrial Matter*, conveying it to all Parts of them; whilst each, by means of Organs 'tis endow'd with for the Purpose, intercepts and assumes into it self such Particles as are suitable to its own Nature, letting the rest pass on through the common Ducts: Nay, we have almost every where Mechanical Instances of much the same Tenor.

'Tis obvious to every one, how easily and suddenly Humidity, or the Corpuscles of Water sustained in the Air, pervade and insinuate themselves into Cords, however tightly twisted into Leather, Parchment, Vegetable Bodies, Wood, and the like.

This

This it is that fits them for Hygrometers, and to measure and determine the different Quantities of Moisture in the Air, in different Places and Seasons.

How freely Water passes and carries with it Terrestrial Matter through Filices, Colatures, Distillations, &c. hath been intimated already.

8. *Water is not capable of performing this Office to Plants, unless assisted by a due Quantity of Heat; and this must concur, or Vegetation will not succeed.*

The Plants that were set in the Glasses Q, R, S, &c. in *October*, and in the following colder Months, had not near the Quantity of Water sent up into them, or so great an additional Encrease by much as those that were set in *June, July*, and the hotter Months. 'Tis plain, Water has no power of moving it self, or rising to the vast Height it does in the more tall and lofty Plants; so far from this, that it does not appear from any Discovery yet made, that even its own Fluidity consists in the intestine Motion of its Parts; whatever some otherwise very learned and knowing Persons may have thought. There is no need of any thing more for solving all the Phenomena of *Fluidity*, than such a Figure and Disposition of Parts, as Water has. Corpuscles of that make, and that are all absolutely *Spherical*, must stand so very ticklish and nicely upon each other, as to be susceptible of every Impression, and tho' not perpetually in Motion, yet must be always ready and liable to be put into it, by any the slightest Force imaginable. It is true, the Parts of Fire or Heat are not capable of moving themselves any more than those of Water; but they are more subtil, light, and active than those are, and so more easily put into Motion.

In fine, 'tis confident, and Matter of Fact, That Heat does operate upon, and move the Water, in order to its carrying on the Work of *Vegetation*; but how 'tis agitated it self, and when the Motion first begins, this is no fit Place to enquire.

That the Concourse of Heat in this Work, is really necessary, appears not only from the Experiments before us, but from all Nature: From our Fields and Forests, our Gardens and our Orchards, we see in *Autumn*, as the Sun's Power grows gradually less and less, so its effects on Plants is remitted, and their *Vegetation* slackens by little and little.

Its Failure is first discernible in Trees; these are raised highest above the Earth, and require a more intense Heat to elevate the Water charged with its Nourishment, to the Tops and Extremities of them; so that for want of fresh Support and Nutriment, they shed their Leaves, unless secured by a very firm and hardy Constitution indeed, as our *Evergreens* are; next the Shrubs part with theirs, and then the Herbs and lower Tribes; the Heat being at length not sufficient to supply even these, tho' so near the Earth, the Fund of their Nourishment. As the Heat returns the succeeding Spring, they all recruit again, and are furnished with fresh Supplies and Verdure; But first those which are lowest and nearest the Earth, Herbs, and they that require a lesser Degree of Heat to raise the Water with its Earthy Charge, into them. Then the Shrubs and higher Vegetables in their Turns; and lastly, the Trees. As the Heat encreases, it grows too powerful, and hurries the Matter with too great Rapidity thro' finer, and more tender Plants. These therefore go off and decay; and others that are more hardy and vigorous, and require a greater

degree of Heat, succeed in their Order. By which Mechanism, provident Nature furnishes us with a very various and differing Entertainment; and what is best suited to each Season, all the Year round.

As the Heat of the several Seasons affords us a different Face of Things, so the several distant Climates shew different Scenes of Nature, and Productions of the Earth.

The hotter Countries, yield ordinarily the largest and tallest Trees, and those too in a much greater Variety than the colder ever do. Even those Plants which are common to both, attain to a much greater Bulk in the Southern, than in the Northern Climes; nay, there are some Regions so Bleak and Chill, that they raise no *Vegetables* at all, to any considerable Size. This we learn from *Greenland*, from *Ireland*, and other Places of like cold Site and Condition. In these no Tree ever appears, and the very Shrubs they afford, are few, little, and low.

Again, In the warmer Climates, and such as do furnish forth Trees, and the larger *Vegetables*, if there happen a Remission, or Diminution of the usual Heat, their Productions will be impeded or diminished in Proportion.

Our late colder Summers have given us Proof enough of this. For tho' the Heat we have had, was sufficient to raise the *Vegetative Matter* into the lower Plants, into our Corns, our Wheat, Barley, Pease, and the like; and we have had Plenty of Strawberries, Raspberries, Currants, Gooseberries, and the Fruits of such other *Vegetables*, as are low and near the Earth: Yea, and a moderate store of Cherries, Mulberries, Plumbs, Filberts, and some others that grow at a somewhat greater height; yet our Apples, our Pears, Walnuts, and the Productions of the taller Trees have been fewer, and those not so kindly, so thoroughly ripen'd, and brought to that Perfection they were in the former more benign and warm Seasons. The Dwarf-apple and Pear-trees have succeeded better; and indeed in Trees of the same kind, those that keep closest to the Earth, always produce the most and best Fruit. For which reason it is that the Gardiners check and restrain the Growth of their better Fruit-Trees, and prevent their running up too great a Height: Now, even the lower Fruits and Greens have had some share in the common Calamity, and fallen short both in Number and Goodness of what the hotter and kinder Seasons were wont to shew us.

As to our Grapes, Abricots, Peaches, Nectarins, and Figs, being transplanted hither out of hotter Climes, 'tis the less wonder we have of late had so general a Failure of them.

Nor is it the Sun, or the ordinary Emission of the Subterranean Heat only, that promotes *Vegetation*; but any other indifferently, according to its Power and Degree.

This we are taught by our Stoves, Hot-beds, and the like. All Heat is of like kind; and where-ever is the same Cause, there will be constantly the same Effect.

There's a Procedure in every part of Nature, that is perfect Regularly, and Geometrical, if we can but find it out; and the farther our Searches carry us, the more shall we have Occasion to admire this, and the better 'twill compensate our Industry.

VEHICLE, in the General, is that which carries or bears any thing along; as the *Serum*, or watery Humour, they say is the Vehicle which serves to convey the Blood Particles, and to disperse them

all over the Body: And in Pharmacy, that Liquid in which any Powder, or such like Medicine, is taken, they call a proper Vehicle for it.

VEJOURS, are such as are sent by the Court to take View of any Place in Question, for the better Decision of the Right. It signifies also such as are sent to view those that Eskin themselves *de malo Leſſi*, whether they be in Truth so sick as they cannot appear, or whether they counterfeit. This Word is also used for those that are appointed to view an Offence, as a Man murdered, &c. See *View*.

VEIN, is a Vessel in an Animal Body, made to receive and bring the Blood back again from the Arteries.

The Veins consist of four Tunicks, a Nervous, a Glandulous, a Muscular, and a Membranaceous one. The Branches of the *Vena Cava*, above the Heart, are called *Jugular Veins*, which go towards the Head; they which go towards the Arms, are called *Axillary*; that about the Heart *Coronary*; in the Lungs *Pulmonary*; in the Liver *Hepatic*, or *Liver Vein*; in the *Diaphragma*, *Pheonica*; in the Thighs *Cruial*; in the Reins *Emulgentis*; and so from its various Ramification, it is variously denominated. *Blanchard*.

VENA Cava: See *Cava Vena*.

VENA Porta, is a notable Vein, so called from the two Eminences, called by *Hippocrates πυλαί*, between which it enters the Liver. The

VENA Porta, as it enters into the Liver, is invested with another Coat, which some call *Vagina Porta*, its Sheath, others *Capſula* or *involucrum*, its Case, or Cover, and *Capſula communis*, because the *Porumbilarius* is involved in it as well as the *Porta*.

This outer Coat it has immediately from the Membrane that cloaths the Liver; that is, it is continued from it, though it be of a clear other Substance, namely more dense and carnos; it is invested with it in all its Ramifications, and so having a double Coat, is in that respect an Artery; as also in that it brings Blood to its Liver for its Nourishment, as well as for other Uses; and lastly, into the *Capſula*, it has an obscure Pulsation (according to Dr. *Gliffon*.)

When it is enter'd about half an Inch into the Liver, it is carried partly to the Right Hand, partly to the Left, and so is shap'd into a *Sinus* as it were, and thence is divided into five large Branches, four whereof are diffus'd all over the hollow Side of the Liver, but the fifth ascends streight to its upper Side, where it disperses it self. The said *Sinus* is more conspicuous in an *Embryo*, because the great Influx of nutritious Juice by the Umbilical Veins enlarge it much. Some make it a sort of a Heart, observing it in an obscurer kind of *Systole* and *Diastole*, whereby the Motion of the Blood in the Branches of the *Porta* within the Liver, is promoted in like manner, as it is in the *Arteria pulmonaris*, and *Aorta* by the Right and Left Ventricles of the Heart. Without which Pulsation, they think the Blood would hardly pass out of the larger Branches of the *Porta* into the narrower, and so on into the Roots of the *Cava*.

In an *Embryo* very observable is the *Tubulus*, or *Canalis Venosus*, which passes directly out of this *Sinus*, into the *Cava*, almost opposite to the Mouth of the Umbilical Vein that opens into the *Sinus*.

This *Canalis*, or Pipe, is of the same Substance and Tincture with a Vein, and enters into the *Cava* just as it penetrates the *Diaphragma*; and there

also two other great Branches out of the Liver are inserted into the *Cava*; and in the same Place this Pipe is also knit to the suspensory Ligament, as it is called, and after the Child is born, grows it self into a Ligament, being in a manner opposite to the Umbilical Ligament.

Its Use in the *Fœtus*, is for the freer and readier Motion of the Blood and Chyle out of the Umbilical Vein into the *Cava*, seeing the Current is hardly strong enough to pervade the *Parenchyma* of the Liver; nor indeed is there any Reason why the said Liquors should pass there-through, seeing there is either little or no Bile therein; or however, they are not yet in a Condition to have the same separated from them. But to return to the Divisions of the *Porta*.

The Ancients taught, that they were only spread in the sinous or hollow Part of the Liver; but Dr. *Gliffon*, in his Accurate Anatomy of it affirms the *Porta* to be dispersed very equally in all its Parts, upper as well as lower.

And whereas it has been a constant Doctrine, That the Branches of the *Porta* open by *Anastomoses*, into those of the *Cava*; the same learned Author, and many others since him, have observed, That there are no such *Anastomoses* at all, but that the Blood doth ouze through the glandulous *Parenchyma* of the Liver, out of the Capillary Veins of the *Porta*, into those of the *Cava*. He that would be fullier informed hereof, may consult his most accurate Book *de Hepate*: But we will now pass to the Branches of the *Porta*, when it is gone out of the Liver.

This Trunk having past a little from the Liver, before it be severed into Branches, puts forth two Twigs, out of its upper and fore-part, which are inserted into the *Cystis fellea*, or Gall-Bladder, (and are from thence called *Cystice gemelle*) about the Neck of it, and spread by enumerable Twigs through its external Coat.

A third Twig also arises single from it, which is larger than either of the former, and is inserted into the Bottom of the right side of the Stomach, from whence it ascends by its hinder side up to the *Pylorus*, which gives it the Name of *Pylorica*; it is otherwise called, *Gastrica dextra*.

Having sent forth these three Twigs, the Trunk passeth down, and bending a little towards the left side, it is parted into two remarkable Branches; whereof the upper is called *Sinister*, or the *Left*, and is the lesser; the lower *Dexter* or the *Right*, which is the larger. The *Left* is bestowed upon the Stomach, the *Omentum*, a Part of the *Colon*, and the Spleen; the *Right* is spread through the Guts and Mesentery; the *Left* is called, *Vena Splenica*; but the *Right*, *Vena Mesenterica*.

The *Vena Splenica*, runs across the Body towards the left side, being sustained by the hinder Leaf of the Cawl, and hath two Branches issuing out of it, before it comes to the Spleen, viz. the *Superior* and the *Inferior*.

The *Superior* is called *Gastrica*, or *Ventricularis*, because it is bestowed upon the Stomach; it ascends obliquely towards the left part of the Stomach, into the back side whereof it is inserted, and divides it self into three Sprigs, of which the two outmost are spent on the Body of the Stomach, but the middle ascends on its back-side up to its upper, or left Orifice, which it encompasses like a Garland, and is called *Coronaria*. From the *Inferior* Branch two Twigs spring; the one is small, and sends

Twigs

Twigs to the right Side of the inner Leaf of the *Omentum*, and to the *Colon* annexed to it. This is called *Epiplois*, or *Omentalis dextra*. The other is spent upon the same Leaf of the *Omentum*, with that part of the *Colon* which it ties to the Back, and is called, *Epiplois*, or *Omentalis postica*.

When the *Ramus Splenicus* hath just approached to the Spleen, it sends out two other Twigs, the upper and lower. The Upper is called, *Vas breve venosum*, and is implanted into the left Part of the Bottom of the Stomach. It is sometimes single, in which case it is properly called, *Vas breve* in the singular Number; but more often there are two, three, or more of them, and then these Vessels, be they one or more, do sometimes spring from the *Ramus Splenicus*, after it has entered the Spleen.

This *Vas breve*, was a Vessel much renowned by the Ancients, who believe it carried an acid Juice from the Spleen to the Stomach, to stir up Appetite, and to help the Fermentation of the Meat in it; but it is certain both by Ligature (whereby it filleth toward the Stomach, and emptieth toward the Spleen) and also by the general Nature of Veins, whose smaller Branches and Twigs still receive the superfluous Arterial Blood, from the part whereinto they are inserted, and conduct it by the larger Channels toward the heart: I say, it is certain from hence, that this same *Vas breve* carries nothing to the Stomach, but only brings from thence, into the *Ramus Splenicus*, the Remains of the Arterial Blood.

From the lower two Twigs issue.

The first is called, *Gastroepiplois sinistra*; this is bestowed upon the left Part of the Bottom of the Stomach, and the Fore-leaf of the *Omentum*, chiefly on its left Part.

The second springeth most commonly indeed from the *Ramus Splenicus*, but sometimes from the left *Mesenterick Vein*; and running along the *Intestinum Rectum*, is inserted into the *Anus*, by many Twigs. This is called, *Hemorrhoidalis interna*, as that which springeth from the *Vena Cava*, is called, *Hemorrhoidalis externa*.

Now followeth the *Vena Mesenterica*, or the right Branch of the *Vena Portæ*. Before it be divided into Branches, it sendeth forth two Twigs.

The first is called, *Gastroepiplois dextra*; this is bestowed upon the right Part of the Bottom of the Stomach, and the right Side of the upper Leaf of the Cawl.

The second is called, *Intestinalis*, or *Duodena*: It is inserted into the Middle of the *Duodenum*, and the Beginning of the *Jejunum*, and runneth lengthways of them; whence some Capillary Twigs go to the *Pancreas*, and the upper Part of the *Omentum*.

After these Twigs are past from it, it enters by one Trunk into the Mesentery, where presently it is divided into two Branches, to wit, *Mesenterica dextra*, and *sinistra*.

Mesenterica dextra (placed on the right Side) is double, and sendeth a great Number of Branches to the *Jejunum*, *Ilium*, *Cecum*, and the right part of the *Colon*, which ascendeth up by the right Kidney and runs under the Liver.

It hath fourteen remarkable, though nameless Branches; and these are afterwards divided into innumerable small Twigs. These are those Veins that are called the *Meseraicks*, whose Branches are supported by the Glandules of the Mesentery, but enter not into them; for the Glands open into the *Vena Laëæ*.

Mesenterica sinistra, passeth thro' the Middle of the Mesentery, to that Part of the *Colon* which descendeth from the left Part of the Stomach, and to the *Intestinum Rectum*.

The Use of the *Portæ*, before the Circulation of the Blood, and the *Vena Laëæ* were found out, was taught to be for the carrying of Nourishment to the Intestines and other Parts contained in the *Abdomen*, and also to bring back from the Guts the purer Part of the Chyle to the Liver to make Blood of, and a thicker feculent Part of it to the Spleen, to be excocted by it into an acid Juice, and then carried to the Stomach by the *Vas breve venosum*, for the exciting of Hunger.

As for this last Opinion, it appears by Ligature, That the *Vas breve* carries its Contents from the Stomach to the *Ramus Splenicus*, and it is nothing but the Blood remaining from the Nutrition of the Stomach, (that was brought thither by the Arteries) which is now a conveying back to the Liver, and so to the Heart again in its Circulation.

And as for the *Meseraicks* carrying Nourishment to the Guts, or bringing back Chyle, those Errors have been sufficiently laid open before now. But their true Use is only to bring back to the Liver from the Guts, Cawl, and other Entrails, that Blood which remains after their Nutrition, and which was carried to them by their respective Arteries.

VENÆ Laëæ, the *Laëæal Veins*, are so called, from the white Colour of the Chyle they carry. These were not discovered as such 'till about the Year 1622. When *Gaspar Afellius* found them out in dissecting a live Dog fed well. Since whom, many others have made more accurate Discoveries of them. They are slender pellucid Vessels, having but a single Coat, and are dispersed in great Numbers thro' the Mesentery, and appointed for carrying the Chyle. Their Rise is from the innermost Membrane of the Intestines, where their Mouths are hid under a kind of spongy Crust, or *Mucus*, thro' which, by the Pressure of the Guts the Chyle is strained, and received by the Mouths of those Vessels. From whence they proceed the nearest or readiest way to such Glandules of the Mesentery as are nearest them; but in their Passage many smaller ones uniting to another, do commonly grow into one large Trunk, and this a pretty way before they insinuate themselves into the Glands they are marching to. But then at their Entrance into the Gland, and sometimes a little before, this Trunk separates again into new Branches more and smaller than the other. And hitherto they bear the Name of *Radicales*, or *Venæ Laëæ primi generis*. After this, out of the Gland there spring again new Capillary ones, which by and by meeting together, make one Trunk again, as before, which keeping its Course towards the Centre of the Mesentery, enters as many Glands as lie in its way, being divided into new Branches just before its Entrance into each Gland, as before: But whilst all the Trunk bend one way, they also meeting with one another, do in Procelles several of them grow into one; and at length all the Trunks arrive at the great or middle Gland of the Mesentery (call'd improperly *Pancreas*) which most of them enter into, but some of them pass over its Surface, and by and by they all empty themselves into the great or common Recepracle of the Chyle that lies behind the said Gland; those that were inserted into it rising out of it in like manner, as they did before out of the lesser Glands. As they run from one Gland

to another, they are called *secundi generis*, or of the second Kind; and from their having pals'd all the Glands to their opening into the common Receptacle, &c. they are called *tercii generis*, or of the third Kind.

VENÆ Lymphaticæ, the *Lymphatick Veins*, receive the *Lympha* from the conglobated Glandules, and discharge themselves either into the Sanguinary Veins, or into the Receptacle of the Chyle.

VENÆ Preputii, are Veins arising from the Capillary Extremities of the Artery of the *Penis* called *Pudenda*, these uniting into larger Branches, pass into those Veins which arise from the *Corpora Caverosa Penis*, and passing under the common Integuments, do empty themselves into the upper Vein of that continued from the *Saphena Vein* of the Foot. *Cowper's Myst. Reformata in Append.*

VENÆ Sectio, is the same with *Phlebotomy*, or Blood-letting.

VENTICTIONI exponas, is a Writ Judicial, directed to the Under-Sheriff, commanding him to sell Goods which he hath formerly by Commandment taken into his Hands, for the satisfying a Judgment given in the King's Court.

VENIRE facias, is a Writ Judicial directed to the Under-Sheriff, and goeth out of the Record, and lies where two Parties plead and come to Issue, for then the Party, Plaintiff, or Defendant, shall have this Writ directed to the Sheriff to cause Twelve Men of the same Country to say the Truth upon the Issue taken. And if this Inquest come not at the Day of the Writ return'd, then shall go a *Habeas Corpora*, and after a Distress, until they come. And it is also a Process upon an *Audita Querela*, or upon an Indictment in the King's Bench, or *Venire facias ad computandum*, against a Tenant, by *Elegit*.

VENIRE facias tot Matronas: See *Ventre inspicendo*.

VENT, in Gunnery, signifies the Difference between the Diameter of a Bullet, and the Diameter of the Bore of the Piece; and is ought to be $\frac{1}{10}$ of the Diameter of the Bore: See *Ordnance*.

VENTER Infimus: See *Hypogastrium*.

VENTERS, according to the Definition of Anatomists, are the three principal Cavities, or hollow Parts of Animal Bodies, viz. those of the Belly, Chest and Head; or the *Abdomen*, the *Thorax*, and the *Caput*.

VENTOSE, a Cupping-Glass: See *Cucurbitula*. The Ingenious Mr. *Hawksbee* hath now found a way of applying Cupping-glasses without Fire, by means of a small Air-pump, which do mighty well, and put the Patient to no Pain or Fright.

VENTRE Inspeciendo, is a Writ for the Search of a Woman that saith she is with Child, and thereby with-holdeth Land from him that is next Heir at Law.

VENTRES: See *Cavities*.

VENTRICLE, the Stomach, is a Membranous Bowel in the *Abdomen*, under the *Diaphragma*, betwixt the Liver and the Spleen, consisting of four Tunicks; a Nervous, Fibrous, Glandulous, and Membranous one: It hath two Orifices, one on the Right Hand, called *Pylorus* and *Junitor*, whereat the Meat is sent out into the Guts: Another on the Left Hand, at which the Meat enters. Its Office is to concoct or ferment the Meat: It is also called *Stomachus* and *Aqualculus*.

VENTRICULI cerebri, the Ventricles of the Brain, are four; the Use of them is to receive the

Serous Humours, and to bring them by the *Pelvis* into the *Pituitary Glandule*, or into the *Processus Mamillares*, by the *Os Cribriforme* to the Nostrils. They are nothing but Complications of the Brain, which happen there as it were by Accident. *Blanchard*.

VENTRICULI Cordis, the Ventricles of the Heart, are two: The first, or Right Ventricle, receives the Blood from the *Vena Cava*, and sends it to the Lungs; the Left Ventricle receives the Blood from the Lungs, and sends it through the whole Body by the *Aorta*, or great Artery, and its Branches: In the *Systole*, or Contraction of the Ventricles, the Blood is sent out: In the *Diastole*, or Dilatation, it is let into the Heart.

VENUE, or *Venue*, or *Visme*, are Terms used in Law, signifying the Place next to that where any thing that comes to be tried happen'd to be done: And therefore for the better Discovery of the Truth of the Matter in Fact upon every Trial, some of the Jury must be of the same Hundred, or sometimes of the same Parish, or Neighbourhood, in which the thing is supposed to be done, who by Intendment may have the best Knowledge of the Matter.

VENUS. The time of the Periodical Revolution of this Planet round the Sun, is 224 Days and $\frac{1}{2}$ of a Day, or $7\frac{1}{2}$ of our Months.

According to Mr. *Cassini*, the greatest Distance of *Venus* from the *Earth* is 38,415, the mean Distance 22,000, and the least Distance 5585 Semidiameters of the *Earth*.

And the Diameter of *Venus* is equal to 7 Semidiameters of the *Earth*; therefore the Globe of *Venus* must be near 43 times greater than that of the *Earth*. But Dr. *Gregory* saith, That to an Eye placed in *Venus*, the Sun's Diameter would appear once and $\frac{1}{2}$ as big again as it doth to us, and therefore his Disk will be more than double of what it appears to us: And the *Light* and *Heat* in this Planet, and its Gravity towards the Sun, will be in the same Proportion in respect of ours.

The Length of the Day in *Venus*, is but 23 Hours.

The Eye here would behold 4 Planets above it, viz. our *Earth*, *Mars*, *Jupiter* and *Saturn*; and one below it, which is *Mercury*: And when our *Earth* is in Opposition to the Sun, it will appear then (in the Night) to shine with a full Orb, and be very bright. The Moon will appear always to accompany the *Earth*, and never to be seen from her above $\frac{1}{2}$ a Degree. *Mercury* will never appear to be above 38 Degrees distant from the Sun.

Kepler saith, The Inclination of the Orbit of *Venus*, is 3 Degrees and 22 Minutes.

October $\frac{1}{4}$ 1666, *Cassini* observed several Spots in the Body of this Planet, by whose Motion he judged (tho' he was not certain) That the moved either by a Circulation, or a kind of Libration round her Axis, in about 23 Hours:

A. D. 1672, and 1686, The same Astronomer, with a Telescope of 34 Foot, believes he saw a *Satellite* moving round this Planet, and distant from it about $\frac{1}{3}$ of *Venus*'s Diameter: It had the same Phasis with *Venus*, but was without any well defined Form, and its Diameter scarce exceeded $\frac{1}{4}$ of that of *Venus*.

Dr. *Gregory* thinks it more than probable, that this was a *Satellite*; and supposes the Reason why it is not usually seen, to be the Unfitness of its Surface to reflect the Rays of the Sun's Light; as is the case of the Spots in the Moon, of which if the whole Disk of the Moon were composed, he thinks that

the Planer could not be seen in *Venus*. *Astron. Phys. & Geom.* p. 472.

Herigone, *Kepler*, and *Rhetensis*, or *Schyrlaus de Rheinf.* conjecture that *Venus* moves round her Axis in about 14 Hours; as *Kircher* and *Schottus* pretend to have discovered, by Observation of certain Spots in her.

VERB, in Grammar, is a variable Part of Speech, expressing the Action of the Mind, which affirms that a Thing is so, or not so; And 'tis either *Personal*, which is conjugated or formed thro' all the Three Persons; or *Impersonal*, which is only found in the Third Person Singular.

VERDEGREASE, is the Rust of Copper gathered by stratifying Plates of Copper with the Husks of pressed Grapes, and then scraping off the Rust of the Plates contracted by lying in those Husks for some time. But the Painters call *Verdegreafe*, or *Verdeter*, a kind of Magistery of the common *Verdegreafe*; which is dissolved in distilled Vinegar, and then Crystaliz'd in a cool Place. These are called Crystals of *Venus*, made by Vinegar.

VERDEROR, is a Judicial Officer of the King's Forest, chosen by the King's Writ in the full County of the same Shire where the Forest is; and is sworn to maintain and keep the Affizes of the Forest; to view, receive and enrol the Attachments and Presentments of all manner of Trespassers of Vert and Venison in the Forest.

VERDICT, is the Answer of a Jury made upon any Cause, Civil or Criminal, committed by the Court to their Examination. And it is either *General*, or *Special*: A *General Verdict*, is that which is given or brought into the Court in like general Terms, to the *general Issue*, as in Action of *Diffesin*, the Defendant pleadeth, *No Wrong, no Diffesin*; then the Issue is *General*, whether the Fact be wrong, or not; which being committed to the Jury, they, upon Consideration of their Evidence, come in, and say, either for the Plaintiff, That it is a Wrong and *Diffesin*; or for the Defendant, That it is no Wrong, no *Diffesin*. A *Special Verdict* is, when they say at large, That such a Thing, and such a Thing, they found to be done by the Defendant or Tenant, do declaring the Course of the Fact, as in their Opinion it is proved; and as to the Law upon the Fact, they pray the Judgment of the Court. And this *Special Verdict*, if it contain any ample Declaration of the Cause from the Beginning to the End, is also called, *A Verdict at large*.

VERDOY; the Term in Heraldry for a Bordure of a Coat of Arms, being charged with any Kinds or Parts of Flowers, Fruits, Seeds, Plants, &c.

VERGE, is the Compass of the King's Court, which bounds the Jurisdiction of the Lord-Steward of the King's Household, and of the Coroner of the King's Houle; and that seems to have been twelve Miles round.

Verge, is also used for a Stick or Rod, by which One is admitted Tenant, and holding it in his Hand, takes the Oath of Fealty to the Lord of the Mannor, and for that cause is called *Tenant by the Verge*. Also, the Spindle of the Balance of a Watch is called the *Verge*.

VERMICULARES: See *Lumbricales*.

VERMICULATION, is an Infection of Plants by Worms.

VERMIFORMIS Proceffus, is the Prominence the *Cerebellum*, so called from its Shape.

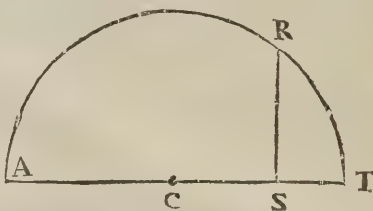
VERMIVOROUS, are such Animals, as feed upon Worms.



VERRY, or *Vairy*, in Heraldry, is of two Sorts. If the Colours (which is a sort of Chequer-work, of the Shape of little Bells) be Argent and Azure, 'tis enough to say *Vairy* alone: But if the Colours are any other, they must be named expressly. They engrave it thus.

VERSED Sine of an Arch, is a Segment of the Diameter of a Circle, lying between the Foot of the Right Sine, and the lower Extremity of the Ark: See more under the Word *Trigonometry*.

Thus *S T* is the Versed Sine of the Ark *R T*; and *A S* the Versed Sine of the Ark *A R*, which is the Supplement of the former.



VERT; the Heralds Word for a Green Colour; and 'tis called Vert in the Blazon of the Coats of all under the Degree of Noble: But in Coats of Nobles 'tis called *Emerald*; and in those of King's 'tis called *Venus*. In Engraving 'tis expressed by Lines drawn athwart, beginning at the Sinister Corner of the Escutcheon, thus.

VERT, in the Forest-Law, signifies every thing that grows and bears a green Leaf within the Forest, that may cover a Deer. And 'tis either *Oververt* or *Nethervert*: *Oververt*, is the great Woods, and in Law Books are usually called *Hault-Bois*: *Nethervert* is the under Woods, otherwise call'd *South-Bois*. There is also a *Specialvert*; that is, all Trees that grows in the King's Woods within the Forest; and those that grow there in other Mens Woods, if they be such Trees as bear Fruit to feed the Deer.

VERTEBRÆ; the *Vertebres* or Joints of the Neck and Back-Bone of any Animal: In a Man they account seven in the Neck, 12 in the Back or *Dorsum*, 5 in the Loins, and 5 of the *Os Sacrum*.

VERTEBRALIS, or *Cervicalis*, is a Pair of Muscles, which extend all the *Vertebrae* of the Body.

VERTEX, is that Point in the Heaven just over our Heads, and the same with *Zenith*; which see.

The Point of any Angle is called also its *Vertex*; and that Point of the Curve of a Conick Section, where the Axis cuts it, is called also the *Vertex* of that Section.

VERTEX, in Anatomy, is also the Crown of the Head, or the middle Part of it, seated between the Bounds of the *Sinciput* and *Occiput*.

VERTEX of a Cone, Pyramid, Conick Section, &c. is the Point of the upper Extremity of the Axis, or

or the Top of the Figure. So the *Vertex* of an Angle, is the Angular Point; and those Angles which being opposite to one another, do touch only in the Angular Point, are called *Vertical Angles*.

VERTEX of a *Glass* (in Opticks) is the same with its Pole; which see.

VERTICAL Circles: See *Azimuths*.

VERTICAL Line: See *Line Vertical*.

VERTICAL opposite Angles: See *Angles*.

VERTICAL Plain in Perspective: See *Plain*.

VERTICAL Point, the same with *Vertex*: So that in Astronomy, a Star is said to be *Vertical*, when it happens to be in that Point which is just over any Place.

VERTICILLATE Plants, are by the Botanists said to be such as have their Flowers intermixed with small Leaves, growing in kinds of *Whirls* about the Joints of the Stalk, as *Penny-Royal*, *Hore-bound*, &c. See *Plants*.

The peculiar Characteristicks of this Genius of Plants, Mr. Ray saith, are, Their Leaves growing by Pairs, one just against another on the Stalk. The Flower *Monopetalous*, but usually hanging down with a kind of Lip, or turn'd something like the Form of an Helmet, four Seeds after each Flower, to which the *Perianthium* of the Flower serves instead of a *Capsula Seminalis*.

Mr. Ray makes two kinds of these *Verticillate Plants*.

I. The *Fruticose*, or such whose Superficies is Perennial; and these have either,

1. A plain Flower, as the *Chamaedrys vulgaris*, *Thoucium*, and the *Marum Syriacum*.
2. Such as have a Flower with a Lip, which they call a *Labiated Flower*, or one something in the Form of a Helmet, which they call *Galeated*; as the *Sacria Stechas*, *Hyssopus*, *Rosmarinus*, *Satureia*, *Marum vulgare*, *Thymum vulgare*, and the *Polium montanum*.

II. The *Verticillate Herbaceae*, or such whose Stalks are not Perennial; and these are the *Mentha*, *Verbena*, *Dittamnus Creticus*, *Origanum*, *Majorana*, *Ocimum*, *Horminum*, *Galeopsis*, *Nepeta*, *Betonica*, *Prunella*, *Stachys*, *Clinopodium vulgare*, *Laminium*, *Molucca Hedera terrestris*, *Galericulata*, *Calamintha*, *Melissa*, *Marrubium Commune*, *Nigrum*, and *Aquaticum*, *Chamaepitys*, *Scardonio*, *Scordium*, *Bugula*, *Sydeitis*, *Cardiaca*.

VERTICITY, the Property of the Loadstone, or a Touch'd-Needle to point North and South, or towards the Poles of the World: See *Magnet* and *Magnetism*.

VERTIGO: See *Scoromia*.

VERY LORD and *Very Tenant*, are Terms in Law, signifying those that be immediate Lord and Tenant one to another.

VESICA: So the Chymists call the large Copper Body Tinned within side, which is commonly used in Distillation of Ardent Spirits, because 'tis in Figure something like a blown Bladder. This is called also a *Cucurbit*, and commonly, a *Body*: See its Figure in *Cucurbit*.

VESICA Urinaria, the Bladder, is a Vessel ap-

pointed to receive the Urine separated in the Kidneys, and brought to it by the Ureters.

It is seated in the *Hypogastrium*, betwixt the two Coats of the *Peritonaeum*, in that Cavity that is formed of the *Os Sacrum*, *Coxae* and *Pubis*, and is called *Pelvis*. In Men, it lies upon the *Intestinum rectum*; in Women, it adheres to the Neck of the Womb, which is placed betwixt the Bladder and the straight Gut: In both, it is knit before to the *Ossa Pubis*. Moreover, it is knit to the Navel by the *Uracha*.

Its Substance is made up of three Membranes.

The first and outmost is borrowed from the *Peritonaeum*. *Riolanus* says, This Coat is a Duplication of the *Peritonaeum*, within which, the Bladder lies hid, suspended like a Bottle turned the Mouth downwards. On its outside, in Man, it is besmeared with Fat, but not in Beasts.

The second is thicker, and endowed with car-nous Fibres; yea, *Agapendens*, *Spigelius*, *Waleus*, and *Bartholin*, will have it to be a true Muscle, serving for the Compression of the Bladder, to squeeze out the Urine; as the Spincter serveth for Constriction to retain it.

The third and innermost, is white and bright, of exquisite Sense, as those know too well who are troubled with the Stone.

Within, it is covered with a slippery mucous Humour, such as the Gall-bladder has on its inside, and such as the Intestines abound with, which, without Doubt, must be sued out of some Glands in this inmost Coat, tho' they be hardly discernable. This doth defend it from the Acrimony of the Urine.

Its Membranes have all Sorts of Fibres. And when these Membranes and Fibres are too long or too far extended with Plenty of Urine, they lose the Power of contracting themselves, whence there issues a Stoppage of Urine.

It is perforated in three Parts, viz. in the Sides, where the Ureters are inserted, to let in the Urine; and before at its Neck, to let it out.

It hath two Parts, to wit, the Bottom, and the Neck.

The Bottom comprehends the upper, wider and more membranous Part of the Bladder, to which the *Urachus* being tied, reaches the Navel, which together with the bordering Umbelical Arteries, become a strong Ligament in the Adult, hindering the Bladder to press upon its Neck. But as for the Arteries, *Riolanus in Animadu. ad Bauch*, affirms, That they contribute nothing to the Suspension of the Bladder, neither reaching to the Navel in the Adult, nor touching the Body of the Bladder of the *Urachus*.

The Neck it lower than the Bottom, thicker and straiter. In Men, it is longer and narrower, and being carried to the Rife of the *Penis*, opens into the *Urethra*; in Women, it is shorter and wider, and is implanted into the upper Side of the *Vagina* of the Womb: In both, it is car-nous and muscular, woven of very many Fibres, especially Transverse or Orbicular, which lie hid within the straight Fibres that surround the whole Body of the

the Bladder, and these make the Sphincter, which constricts the Neck of the Bladder so, as no Urine can pass out against ones Will, unless when it is affected with the Palsy, Ulcer or other Malady, by which there sometimes happens an involuntary Pissing.

The Bladder is oblong and round, in Shape like unto a Pear.

Its Cavity is but one ordinarily, yet sometimes it has been found to have a membranous Partition, that divides it into two, which yet had a Hole in it for the Communication of one Cavity with the other. Such a Partition was observed in the Bladder of the Great Casaubon.

It hath Arteries and Veins from the *Hypogastricæ*, which are inserted into the Sides of its Neck, where they are immediately branched into two, whereof one is spent upon the Neck, and the other on the Bottom. Nerves it hath (according to Dr. Willis) from the lowest Plexus of the Intercostrals in the Abdomen, and from the Marrow of the Os Sacrum. For the said Plexus sending two Nerves into the Pelvis, they have each of them a vertebral Nerve joined to them, and so make two new Plexus, from one of which there passes a Nerve that being divided into many Branches, is on each Side distributed into the Bladder, and its Sphincter Muscle.

The Use of the Bladder is to receive the Urine from the Ureters; and to contain it, like a Chamber-pot, until the Time of Excretion, when it is squeezed out of it, by the help partly of its own carnosus Membrane, and partly of the Muscles of the Abdomen.

Bartholin quotes some Observations of Borrichius, concerning the Bladder, worthy to be noted, viz. "If it be boild in Acids, it turns into a Mucilage; "if it be in Salt Liquors, it is thickned; if in Oleous, or in the Liquor of the Alkali Salts of Tartar, or Herbs burnt to Ashes, it is neither thickned, nor turns into a Mucilage, but is burnt, as "if it were laid on burning Coals, and may almost be crumbled to Powder. By which (says he) it appears, with what great Danger to the Bladder, Men inject into it, either acid, salt, or oleous Liquor, for breaking the Stone.

VESICATORIA, are Medicines which act upon, and rarify the Spirits and ferous Particles, gather themselves betwixt the Skin and Cuticula, and consequently separate them, and raise little Blisters full of ferous Matter, which are called Blisters.

VESICULA Felli: See Folliculus Felli.

VESICULÆ Seminales, the Seed Bladders, are little Cells like those in a Pomgranate, or somewhat resembling a Bunch of Grapes. De Graef compares them to the Guts of a little Bird variously contorted.

They consist of one thin Membrane, through which some small Twigs of both Veins, Arteries, and Nerves run. They are about three Fingers-breadth long, and one broad; but in some Places broader, and some narrower, as they run in and out. They are two (one for each Vas deferens) divided from one another by a little Interstice; and they do severally, by a peculiar Passage, emit the Semen contained in them into the Uretbra.

They are very anfractuons and winding, and (as was said) consist of many little Cells, that they should not pour out all the Semen contain'd in them

in one Act of Copulation, but might retain it for several. They have no Communication one with another, nor even in their very opening into the Uretbra; but the Semen that is brought to the Vesiculæ Seminales on the right Side, by the right Vas deferens, issues by its proper Passage into the Uretbra, and that which is brought to the left likewise. So that, if by any Accident, the Vesicula on one Side be burst or cut (as in Cutting for the Stone they generally are) yet those on the other, being entire, may still suffice for Generation. Now when the Semen is emitted out of these Vesiculae in the Act of Generation, it passes out the same way it came in, which in this case may easily be, (tho' otherwise it be unusual there should be a contrary Motion of the same Vessel) for, as it comes in from the Vasa deferentia, it drills along gently, without any Force; but in Coitu, when the Muscles of the Penis, and all the bordering Parts, are much Tumified, it is expressed or squirted out of them with some Violence; and passing along, their Neck, (which is a Continuation of the Vasa deferentia) oozes through a Carbuncle (like Quicksilver thro' Leather) into the Uretbra, or the Duct of the Penis, that is common both to the Semen and Urine. I say, it oozes from the Necks of the Vesiculae thro' a Carbuncle into the Uretbra, for there is one placed as a Valve before the Orifice of each of them, partly to hinder the coming of the Urine into them, partly to hinder the involuntary Effusion of the Semen.

Now, though naturally the little Holes through which the Semen passes out of the Necks of the Vesiculae into the Uretbra, be almost imperceptible, yet if they be either eroded by the Acrimony of the Semen (such Acrimony as is contracted by impure Embraces, or in Claps, as we call them) or if of themselves they be debilitated, and so become more Lax (as sometimes happens) to old or impotent Men, that meddle too much) then there happens a Gonorrhæa or continual Efflux of Semen: And so Vasalius and Spigelius have observed them much dilated, in dissecting such as have died with a Gonorrhæa upon them.

VESPERTILIONUM ale, are two broad membranous Ligaments, on each Side one, where with the bottom of the Womb is loosely tied to the Bones of the Flank. Artæus likens them to Bats-wings, whence the Name. Blanchard.

VESPERTINE, in Astronomy, when a Planet sets after the Sun, it is said by some to be Vesperine.

VESSELS, in Architecture, are certain Ornaments, usually set over the Cornices, and so nam'd, because they represent divers sorts of Vessels, which were in use among the Ancients.

VESTIBULUM, is a Cavity in the Os Petrosum, behind the Fenestra Ovalis, it is covered with a fine Membrane; in it open the semicircular Pipes of the Labyrinth. The upper Turning of the Cochlea, and the Auditory Nerve pierce into it also.

VESTIGIA of Tendons are the little Hollows in the Shells of Fishes, which are formed on purpose for the fastening or rooting of the Tendons of their Muscles. These are plainly found on all the Fossile Shells; and this is a Demonstration, that once they really belonged to Fishes, and are not formed Stones.

VESTURE, in Law, signifies a Possession or an Admittance to a Possession or Seisin. Thus it is also taken by the Feudists, with whom Investitura signifies

fies a Delivery of Possession by a Spear or Staff, and *Vestura* Possession it self.

VETERNUS : See *Letbargus*.

VERU, a Comet, according to some Writers, resembling a Spit, being nearly the same kind, as the *Lancibites*, only its Head is rounder, and its Train longer and sharper pointed.

VETITUM *namium*. *Namium* is a Distress, and *Vetitum* forbidden : Thus when the Bailiff of a Lord distrains Beasts or Goods, and the Lord forbids his Bailiff to deliver them when the Sheriff comes to replevy them ; and to that end, drives them to Places unknown ; or when without any Words they are so cloined, as they cannot be replevied, divers Lords of Hundreds, and Courts-Barons, have Power to hold Plea *De vitito namio* : See *Naam*.

VI & *armis*, an Expression in a Charge or Indictment, to shew the forcible and violent Commission of any Crime.

VI *Laica amovenda*, when the Bishop of a Diocese has certified into the Court of Chancery, that the Rector or Vicar of any Church within his Jurisdiction, is kept out of his Manse, or Glebe, or Church, by any Lay-force or intruding Power ; then may a Writ be granted to the Sheriff, to remove all such Violence, and such Usurpation ; which Writ is therefore called, *De vi Laica amovenda*.

VI *Laica removenda*, is a Writ that lies where Debate is between two Parsons or Provisors for a Church, and one of them enters into it with a great Number of Lay-men, and holds the other out *Vi & Armis* ; he that is holden out, shall have this Writ directed to the Sheriff. That he remove the Force. And this Writ is returnable, and shall not be granted, until the Bishop of the Diocese, where such Church is, hath certified into the Chancery, such Resisting and Force.

VIA *Lactea* : See *Milky-way*.

VIBRATION, is the Swing or Motion of a Pendulum ; or of a Weight hung by a String on a Pin : See the Proportions of the Vibrations of Pendulums, under *Pendulum*.

VIBRISSÆ, are the Hairs which grow in the Nostrils : They, with the *Mucus*, which the Glands separate, stop any Filth from ascending too high up into the Nostrils.

VICARIO *deliberando occasione cujusdam Recognitionis*, &c. is a Writ that lies for a Spiritual Person imprisoned, upon Forfeiture of a Recognition, without the King's Writ.

VICENETUM : See *Venue*.

VICIS & *venellis Mundandis*, is a Writ that lies against a Mayor or Bailiff of a Town, &c. for the clear keeping of their Streets.

VISCOUNTIEL, in Law, signifies as much as belonging to the Sheriff ; as *Writs Viscountiel* are such Writs as are Triable in the County or Sheriff's Courts. *Viscountiel*, signifies also, certain Farms for which the Sheriff pays a Rent to the King, and makes what Profit he can of them.

VIEW, in Law, signifies the Act of Viewers ; for when an Action real or personal is brought, and the Tenant knows not well what Land it is that the Demandant asks, then he may pray the *View* ; which is, that he may see the Land which is claimed.

VIEW of *Frank-pledge*, is the Office which the Sheriff in his County-Court, or the Bailiff in his

Hundred, performs in looking to the King's Peace, and seeing that every Man be in some *Pledge*.

VILLAIN, is the same with Servant or Bondman ; and there were formerly in England two sorts of these Villains : *Villains in gross*, who were bound immediately to the Persons of their Lords, and to their Heirs ; and *Villains Regardent to a Mannor* ; these the Civilians call *Gleba Ascriptitius* ; and they were bound to their Lord as Members belonging to such a Mannor, of which he was Owner. This latter was a pure Villain, of whom the Lord took Redemption to marry his Daughter, and to make him Free ; and he might put him out of his Lands and Tenements at his Will ; might beat and chastize him, but not maim him. We have now no such Slaves as these.

VILLENAGE, signifies a servile kind of Tenure, anciently belonging to Lands or Tenements, whereby the Tenant was bound to do all such Services as the Lord commanded. Of this Villenage, there are several sorts, but the Slavery of such a Custom is now laid down in *favorem libertatis*, tho' the Statute concerning them be unrepealed.

VILLI, in Botany, are small Hairs like the Grain of *Plush* or *Shag*, with which, as with a kind of Excellence, some Trees do abound. Of this kind is the *Usnea Officinarum*.

VINDEMIATRIX, a Fixed Star of the third Magnitude, in the Constellation *Virgo*, whose Longitude is 185 degr. 23 min. Latitude 16 degr. 15 min.

VINUM *Hypocraticum*, is a Wine wherein Sugar and Spices have been infused, and is afterwards strained through a Bag, which they call *Manica Hippocratis* ; which see. *Blanchard*.

VIOL, a kind of Hawker (in a Ship) made use of to purchase in the Cable, when the Main-Capstan cannot do it, because the Ground in which the Anchor is let fall, is too stiff, or else the Sea runs too high, so that they cannot weigh it ; then for more help, they take a Hawker, and opening one Strand thereof, they put therein Nippers, (that is, small Ropes, with a little Truck at one end) and with these they bind fast this Hawker to the Cable, and then they bring it to the *Jeer-Capstan*, and so heave upon it : And this *Viol* will purchase far more than the Main-Capstan can. This *Viol* is fastned together with an Eye and a Wale-knot, or else with two Eyes seized together.

VIRGÆ, is a Meteor, representing a Bundle of Rods, and made by the Sun's-beams piercing the more lax and open Parts of a watry Cloud.

VIRGINS Milk, is made by dissolving *Saccbarum Saturni* in a great deal of Water : It will turn white as Milk ; whence the Name. If the Dissolution be left to settle, the white Matter will precipitate, and may be used as a *Magistery of Saturn*.

VIRGO, one of the 12 Signs of the Zodiac, being the 6th according to Order.

VIRGULA *Divinatoria*, is a Hazle Rod shaped into two Branches like a Y, which must be cut at the time of some certain Planetary Aspect, and by which (as some Writers pretend) you may easily find out a Vein of rich Metal or valuable Oar in the Earth.

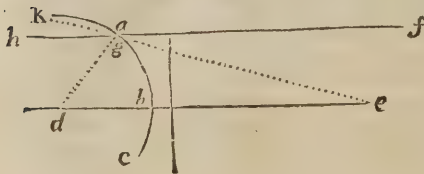
Mr. Boyle tells us, That some Authors report the Fact : But I judge we may very reasonably suspect, if not deny the Truth of the Relation, for all this ; for he himself owns he could never find any thing

thing in it: And so saith Kircher, tho' a Person otherwise subject enough to tell strange Stories.

Some use, as is said above, a forked Rod, holding the two Ends in their Hands: Others tie a Hazle-Wand to another streight Stick, and holding it in their Hand, do so walk over the Hills and Places where they expect Metals. But they all own the Rod to be very cross-grain'd, and that it will work, as they call it, in some Mens Hands only, and at some certain Times, and not at others, in the Hands of the same Persons.

VRIDARIO eligenda, is a Writ that lies for the Choice of a *Verdoror* in the Forest.

VIRTUAL Focus, or *Point of Divergence* in a Concave-Glass, is the Point *e* in the following Figure.



Let the Concavity of the Glass be *abc*, and its Axis *de*: Let *fg* be a Ray of Light falling on the Glass, parallel to the Axis *de*; and let *d* be the Center of the Ark *abc*. This Ray *fg*, after it hath passed the Glass at its Emerſion at *g*, will not proceed directly to *b*, but be refracted from the Perpendicular *dg*, and will become the Ray *gk*. Draw then directly *gk*, so as that it may cross the Axis in *e*. The Point *e* so found, Mr. Molyneux calls the *Virtual Focus*, or *Point of Divergence*. P. 56. *Dioptr. Nov.*

VIS, or *Force*; as *vi & armis*, by Force of Arms. And this *Vis* is fivefold, *Vis impulsiva*, *ablative*, *expulsiva*, *turbativa*, and *inquietativa*. *Vis ablativa*, is the taking away of moveable Things: And hence accrues an Action, *Quare vi & armis*, &c. *Vis compulsiva* is, when any one is cast out of his Possession by Force and Arms. *Vis turbativa*, is when any one is disturbed in his Possession, as when two strive to possess the same Thing. *Vis inquietativa*, is when one Man will not suffer another quietly to enjoy his Right, or to do any thing in his own Bounds or Limits. And from all these some sort of Action will arise.

VIS Centrifuga, is the Force by which any Body revolving round another, endeavours to fly off from the Axis of the Motion, in a Tangent to that Curve.

The Centrifugal Force is always proportional to the Periphery which any Body describes in its Motion round the Axis of its Motion, by the first Theorem of Mr. Huguen's *de vi Centrifuga*.

VIS Centripeta, is that by which any Body (from what Cause soever) tends towards any Point as to its Center.

Of this kind is *Gravity*, by which Bodies tend towards the Center of the Earth: And such is the *Magnetical Force* by which Iron tends towards the Center of the Magnet: And of this kind is that Force or Power whatever it be, by which all the Planets are continually drawn from a Rectilineal Motion, and forced to revolve in Curves.

The Quantity of this Centripetal Force, is of three kinds; *Absoluta*, *Acceleratrix*, and *Motrix*.

The *Absolute Quantity* of it, is its Measure, greater or less, according to the Efficacy of the Cause that produces it; and which exerts it self on all Bodies in the Regions round about: As the *Magnetical Vertue* in some Magnets is greater than in others, tho' of the same Dimensions.

Vis Centripeta Quantitas Acceleratrix, is its Measure proportionable to the Velocity which it produces in a given Time. Thus the Power of a Loadstone is greater at a less, and lesser at a greater Distance from the Stone. Gravity is greater in Valleys, and less on the Tops of high Mountains, (as is plain from the Experiments of Pendulums) and is yet less at remoter Distances from the Earth: But at equal Distances, 'tis always the same, because all Bodies, heavy or light, great or small, abstracting from the Resistance of the Medium, are equally accelerated in their Descent.

Vñ Centripeta Quantitas Motrix, is its Measure proportionable to the Motion which it generates in a given time: As the Weight is greater in a greater Body, and less in a lesser; and in the same Body, it is greater near the Earth, and less in remote Regions. This Force is the *Gravity* or Tendency towards the Center of the whole Body, and is all one with its *Weight*, being always discoverable by some equal and contrary Force hindering the Descent of the heavy Body.

The *Vires Centripetae*, are always as the Squares of the Velocities divided by the Radii of the Circles described round the Center.

And also reciprocally, as the Squares of the Periodical Revolutions divided by the Radii.

Wherefore if the Periodical Times be equal, both the Centripetal Forces and Velocities, will be as the Radii; & *vice versâ*.

If the Squares of the Times of the Periodical Revolutions are as the Radii, the Centripetal Forces are equal; and the Velocities in half the Ratio of the Radii; & *vice versâ*.

If the Squares of the Periodical Times are as the Squares of the Radii, the Centripetal Forces are reciprocally as the Radii, and the Velocities equal, and *vice versâ*.

If the Squares of the Times of the Periodical Revolutions are as the Cubes of the Radii, or Distances from the Center, (which is the Case of all these Planets moving round the Sun, and of the Moon's or Secondary Planets moving round the Primary) then the Centripetal Forces (or Gravity of Bodies) are as the Squares of the Radii or Distances from the Center, (as we find it to be) and the Velocities are in half the Ratio of the Radii, and *vice versâ*: See Sir Isaac Newton's *Princip. Phil. Mathematic.* p. 39.

If the Centripetal Force of any Body moving round another, be as the Distance; that Body moves in an Ellipsis, having its Center in the Center of that Force; or perhaps in a Circle equal to that Ellipsis. *Idem*.

As to which, *Gallileus* hath this Theorem, That if such an Ellipsis, its Foci becoming infinitely distant, should change into a Parabola, the Body would move into the Curve of such a Parabola; and the *Vis Centripeta* respecting now a Center infinitely distant, would grow *Equable*. To which Sir Isaac Newton adds, That if a Parabolick Section of a Cone, by the Inclination of its Plane to the

Side of the Cone, should be turned into an Hyperbola, the Body would continue to move in its Perimeter; and its *Centripetal Force*, would be changed into a *Centrifugal* one.

If any Body freely revolve round a Center, as in the case of the Planets round the Sun, its *Centripetal* and *Centrifugal Forces* must be equal.

VIS Impressa, is an Impulse, Force, or Action, communicated to, and exercised upon any Body, in order to change its present State, either of Rest or Motion, uniformly forward in a right Line. *Newt. Princip. Mat.* This Force consists entirely in Action, and after that ceases, cannot remain in any Body: For the Body continues in its new State, whether of Motion or Rest, by the *vis Inertia* only.

VIS Infitae Materiae, is the bare Power of Resistance only, by which every Body, as much as it may, endeavours to continue in that State in which it is, either of Rest, or Motion, uniformly forward in a right Line. This is always proportionable to the Body or Mass which it is in, and differs nothing from the *Inactivity* of the Matter or Body, but only in the manner of Conceiving it: And therefore, this *Vis Infitae*, may most properly be call'd *Vis Inertia*. *Newt. Princip. Math.*

VIS Motrix, is the Power which produces the Motion of any Body from Place to Place: Thus Gravity is a *Vis Motrix* downwards, or towards the Center of the Earth.

VISCERA are the Bowels contained in the three great Cavities of the Body, as the Anatomists call them. They are called also *Extæ* and *Interranea*.

VISIBLE Horizon: See *Horizon*.

VISIBLE Place of a Star: See *Apparent Place*.

VISIBLE Species: See *Speciales Visibiles*.

VISION, is a Sensation in the Brain, proceeding from a due and various Motion of the Optick Nerve, produced in the Bottom of the Eye, by the Rays of Light coming from any Object; by which means the Soul perceives the illuminated Thing, together with its Quantity, Quality, and Modification.

Whether the Picture of the Object be made on the *Tunica Retina*, or on the *Choroides*, there is a great Dispute between Mr. *Pecquet* and Mr. *Mariotte*, in the *Philos. Trans.* N^o 59, &c.

As to the manner how this noble Sense of Seeing is produced, there were many Hypotheses among the Ancients.

1. The *Stoicks* imagined, That certain visual Rays went from the Brain through the Optick Nerve and Eye, and from thence to the Object; and there (just like a Blind Man's Staff) feel out the Figure, Colour, and Dimensions of the Object.

2. The *Pythagoreans* thought, That there went some visual Species out of the Eye to the Object, which were immediately reflected back again from thence to the Eye, and so produced *Vision*.

3. *Plato* supposed, That both from the Eye and the Object, there came substantial Effluvia, which meeting half way, and encountering the Ocular Effluvia, the latter were bear back again to the Eye, and there communicated the Impression they had received from those Effluvia which came from the Object; and so caused the Sense of Seeing.

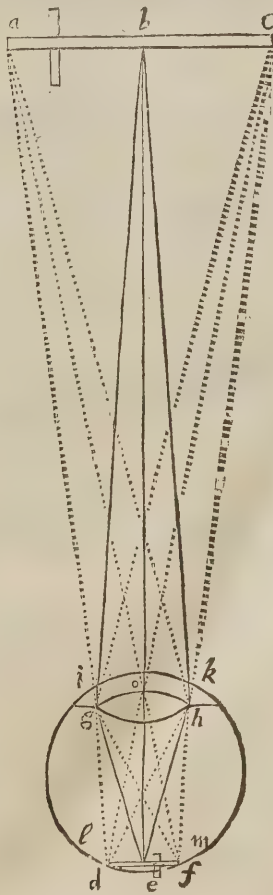
4. *Aristotle* asserted, That the Colours of all Objects did move the transparent Medium, as that did the Eye, and thereby communicate their Images to the Brain, or *commune Sensorium*.

5. *Epicurus*, judiciously rejecting the Notion of an Emanation of visible Species from the Eye; and not thinking the Action of the intermediate Air or Medium sufficient to account for Vision, rightly concluded, That the Sense of Vision was produced by a substantial material Efflux from the Object to the Eye.

6. *Cartez* supposes Vision performed by bare Motion only, without any material Emanation from the Object; but only that the Light (which with him also is not a Body, but the Motion of the finer Parts of the Medium) moves the Eye just after the same manner as the Object is supposed to have determin'd it; which Motion is continued along the Optick Nerve, up into the Brain, where it moves the *Conarion*, or *Glandula Pinealis*, with him the Seat of the Soul; and, by that means produces internal Sensation, and enables the Soul to judge accordingly.

The Manner of the Vision with the naked Eye, according to Mr. *Molyneux* his Explication of it, in *Dioptr. Nov.* p. 103.

Suppose *a b c* an Object, *i k l e m* the Globe of the Eye, furnished with all its Coats and Humours; but here the *Crytalline Humour g o h* is only express'd, as being principally concern'd in forming the Image on the Fund of the Eye.



T. From

1. From each Point of the Object, we may conceive Rays flowing to the Papil of the Eye ik ; as here from the middle Point b , there proceed the Rays bg , bo , bb ; these by means of the Coats and Humours of the Eye, and especially by the Crystalline Humour gh , are refracted and brought together on the *Retina* or Fund of the Eye in the Point e , and there the Point b is represented. For we may conceive the Crystalline Humour gh , as it were a Convex-glass, in the Hole of a dark Chamber $ilmk$, and that def is the distinct Base of this Glass.

What is here said of the Point b , and its Representation at e , may be understood of all the other Points in the Object, as of a and c , and their Representations at f and d . For, according to Sir Isaac Newton's best Hypothesis of Light, each Ray has its innate Colour, and so will represent it where it falls.

2. As in a dark Chamber that has a Hole furnished with a Convex-glass, if the Paper that is to receive the Image in the distinct Base, be either nigher to, or farther from the Glass, than its due Distance, the Representation thereon is confus'd: For then the Radius Pencils do not exactly determine with their Appices on the Paper; but those from one Point are mix'd and confus'd with those from the adjacent Point: So in the Case of *Plain Vision*, 'tis requisite that the Pencils should exactly determine their Appices at def , on the *Retina*, or else Vision is not distinct.

Therefore, Nature has so contriv'd the Eye, That it should have a Power of adapting it self in some measure to nigh and distant Objects, for they require different Conformation of the Eye, because the Rays proceeding from the Luminous Points of nigh Objects, do more diverge than those from more remote Objects: But whether this Variety of Conformation consists in the Crystallines approaching nigher to, or removing farther from the *Retina*; or in the Crystallines assuming a different Convexity, sometimes greater, sometimes less, according as is requisite, is left to the Scrutiny of others; and particularly the Curious Anatomists. This only may be said, That either of these Methods will serve to explain the various *Phænomena* of the Eye: And that both these may attend each other, *viz.* a less Convex-Crystalline requires an Elongation of the Eye, and a more Convex-Crystalline requires a shortning thereof; as a more flat Convex Object-glass, or of a larger Sphere, requires a longer Tube; and one protuberant, bulging, or of a smaller Sphere, requires a shorter Tube.

3. By the former Figure we perceive the Rays from each Point of the Object are all confus'd together on the Pupil in gh , so that the Eye is placed in the Point of the greatest Confusion: But by means of the Humours and Coats thereof, each Cone of Rays is separated, and brought by it self to determine in its proper Point on the *Retina*, there painting distinctly the Vivid Representation of the Object, which Representation is there perceived by the *Sensitive Soul*.

4. We are likewise to observe, That the Representation of the Object abc , on the Fund of the

Eye fed is inverted: For so likewise it is on the Paper in a dark Room; there being no other way for the Radius Cones to enter the Eye, or the dark Chamber, but by their Axis ao , bo , co , crossing in the Pole o of the Crystalline, or Glass.

But how comes it to pass, that the Eye receiving the Representation of a part of an Object on that Part of its Fund which is lowermost, or nighest the Center of the Earth, perceives that Part of the Object as uppermost, or farthest from the Center of the Earth? In answer to this, let us imagine, that the Eye, in the Point f , receives an Impulse or Stroke by the Prorusion forwards of the Luminous Axis aof , from the Point of the Object a ; must not the visive Faculty be necessarily directed hereby to consider the Stroke, as coming from the Top a , rather than from the Bottom c , and consequently should be directed to conclude the Representation of the Top?

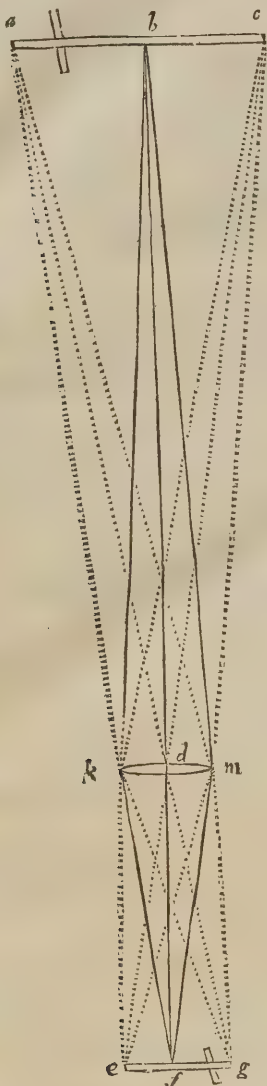
Therefore we may be satisfied by supposing a Man standing on his Head: For here, tho' the upper Parts of Objects are painted on the upper Parts of the Eye, yet the Objects are judged to be erect. And from this Posture of a Man, the Reason appears, why we have used the Words *farthest from*, and *nighest to the Center of the Earth*, rather than *upper* and *lower*: For in this Posture, because the upper Parts of the Objects are painted on that Part of the Eye nighest the Earth, (tho' really the upper Part of the Eye) they are judged to be farthest removed from the Earth.

What is said of *Erect* and *Reverse*, may be understood of *Sinister* and *Dexter*.

5. The Image of an *Erect* Object being represented on the Fund of the Eye *Inverted*, and yet the Sensitive Faculty judging the Object *Erect*, it follows, That when the Image of an *Erect* Object is painted on the Fund of the Eye *Erect*, the Sense judges that Object to be *Inverted*.

6. The Magnitude of an Object, is estimated by the Angle the Object subtends before the Eye. Thus, the Length of the Object ac , is estimated by the Angle aoc , fod , and this is called the *Optick Angle*.

Whence it follows, that if the Eye were placed instead of the Glass at d (Fig. 2.) and abc , or efg were Objects, the Eye would perceive them of equal Bigness.



The Point *o*, which is the Vertex of the Optick Angle, is variously assigned by various Authors; some placing it in the Centre of the Eye; others in the Vertex of the Crystalline; others in the Vertex of the outward Coat or Cerebra of the Eye; but 'tis a Matter of no great Consequence where-ever we place it; for according to the Bigness of this Angle *a o c*, the Image on the Fund of the Eye is bigger or less.

7. We perceive the Rays that flow from the Point *b*, do proceed to the Eye Diverging, as *bg, bo, bb*: And if the Object *a c* were infinitely distant from the Eye, or so distant from the Eye, that the Breadth of the Pupil *ik* were insensible in Comparison to this Distance; then the Rays *bg, bo, bb*, would proceed as it were parallel, and so fall on the Eye: In both which Cases, by means of the

Refractions of the Eye, they are brought together, and Point the Image of the Point *b*, on the Fund of the Eye at *e*.

But if the diverging Rays *bu, bx*, (Fig. 1.) that flow from the Point *b*, meet the Convex-glass *vx*, and are thereby made to converge, as *vi, xk*, and so fall on the Eye, and there passing through the Crystalline *gh*, are made to converge yet more, as *ie, ke*: Here they cross in the Point *e*, before they reach the Retina *rt*, and consequently do point thereon the Image of the Point *b* confusedly, for 'tis planted on the Space *rt*; whereas to cause distinct Vision, it should only be painted on a correspondent Point on the Retina.

And this is the Fault of their Eyes, who are called *Myopes*, *Purblind*, or *Short-sighted*: For in them the Crystalline is too Convex, (as in Fig. 3, both the Convex-glass and Crystalline joyn'd together, make too great a Convexity) uniting the Rays before they arrive at the Retina. And therefore they are help'd by Concave-glasses, which take off from the too great Convexity of their Crystalline, some part of its Refractive Power: Or rather these Concaves make the Rays diverge so, that their Crystalline shall be sufficient only to bring them again together, so that they be not touched, till they arrive at the Fund of the Eye.

Myopes are also help'd, by holding the Object very near; for then the Rays that fall on their Eye from any single Point, do more diverge, than when the Eye is farther from the Point, and consequently their too Convex Crystalline doth but suffice to bring them together on the Retina.

8. On the contrary, the Eyes of Old Men have their Crystalline too flat, (as Fig. 4) and cannot correct the Divergence of the Rays

bu, bk, to make them between the Retina *rt*, but beyond the Eye at *c*. Wherefore for their help 'tis requisite they add the adventitious Convexity of a Glass; that both it and the Crystalline together, may be sufficient to unite the Rays just at the Retina: And from hence it appears, that Spectacles help



Old Men, not by magnifying an Object, but by making its Appearance distinct; for Old Men cannot read the largest Print without Spectacles, and yet with Spectacles they read the smallest; tho' these with Spectacles do not appear so large, as those without Spectacles.



9. What is said of the confused or distinct Representation of a Point in the Object, may be understood of the confused or distinct Representation of the whole Object; at least, for those Parts that lie pretty nigh adjacent to that Point that is looked at. For here we do not see a Point, in the strict Sense of the Mathematicians, but in a Physical Sense, for the smallest part imaginable; and the whole Object consisting of such Points, what is shewn of one Point, may be understood of every Point in the Object.

Distinct Vision, is caused, when the Pencils of Rays from each Point of an Object, do accurately determine in correspondent Points of the Image on the *Retina*.

Confused Vision, is caused when these Pencils do intermix one with another.

Clear Vision, is caused by a great Quantity of Rays in the same Pencil illuminating the correspondent Points of the Image strongly and vigorously.

Faint Vision, is when a few Rays make up one Pencil: And tho' this may be *distinct*, yet 'tis dark and *obscure*; at least, not so *bright* and *strong*, as if more Rays concurred.

VISITATION, is that Office or Action that is perform'd by a Bishop in every Diocese once every three Years, or by the Arch-deacon once a Year, by visiting the Churches and their Rectors, &c.

VISNE: See *Venue*.

VISORIOUS: See *Optick Nerves*.

VISU Franci plegii, is a Writ to exempt him from coming to the *View of the Frank Pledge*, who is not Resident within the Hundred; for Men are bound to this *View*, by reason of their Habitation, and not of Lands held where they dwell not.

VISUAL Point in a Perspective, is a Point in the Horizontal Line, wherein all the Ocular

Rays unite; as if a Man stood in a long strait Gallery, wherein looking directly forward, the Sides, Floor, and Ceiling at last seem to be united, and to touch one another in a Point or common Centre.

VISUAL Rays: See *Rays*.

VITAL Faculty, is an Action whereby a Man lives, which is performed, whether we design it or no; such are the Motion of the Heart, Respiration, Nutrition, &c. It depends chiefly upon the *Cerebellum*. It is the same with Natural Faculty, tho' the Ancients distinguished them, placing the Natural in the Liver, and the Vital in the Heart.

Blanchard.

VITAL Flame: See *Flamma Vitalis*.

VITAL Indication, in the Art of Medicine, is such an one as requires the restoring and preserving of the natural Strength of the Body.

VITALIGO, a sort of Leprosie; there are three kinds of them.

Albus, where the Colour is White, something rough, and not continued, like so many Drops here and there; but sometimes it spreads broader, and with some Intermixions.

Melas differs in Colour, because it is Black, and like a Shade; in the rest they agree.

Leuce has something like *Albus*, but it is whiter, and descends deeper, and in it the Hairs are White, and like Down: All these spread, but in some quicker, in others slower.

VITRIFICATION, the turning of any Body into Glas by the Force of Fire: This (by the Chymists) is look'd upon as the Ultimate Action of Fire, and Bodies when once they have gain'd the Form of a Glas, do (generally speaking) continue in that Form, and are not capable of putting on any other Shape.

Most kinds of *Vitrifications* (as also *Calcinations*) are made by Salts uniting and incorporating with the Metalline Particles.

VITRIOL of Copper or Venus, is *Blue Chrystals* made by a Solution of Copper in Spirit of Nitre, Evaporation, and Chrytallization in a cool Place. These are used as Cauticks, but they will dissolve if expos'd to the Air.

There are other Chrystals of *Venus* made by distilled Vinegar, and they are what is called *Vergrease*; which see.

VITRIOL of Mars, or *Salt of Steel*, is made by dissolving Steel in some proper *Acid Menstruum*, then Evaporating and Chrytallizing to gain the as above in Copper.

VITRIOL of Silver, or of the Moon: See *Chrystals of Silver*.

VITRIOLATE Tartar: See *Tartar Vitriolate*.

VITRIOUS Humour, or *Glassie Humour of the Eye*, is the third Humour of the Eye, so called from its Resemblance of the melted Glas. 'Tis thicker than the *Aqueous*, but not so solid as the *Chrystalline*. 'Tis round or convex behind, and somewhat plain before, only hollowed a little in the Middle where it receives the *Chrystalline*. It exceeds both the other Humours in Quantity.

VITRIOUS Tunicle, a thin Film, or Coat, which is said to separate the *Glassie Humour* from the *Chrystalline*; tho' there are some who absolutely deny, That there is any such Coat in the Eye, before the Humours are taken out and expos'd to the Air.

VIVA VOCE : See *Depositions*.

VIVIPAROUS *Animals*, are such as bring forth their Young living and perfect ; by which they are distinguished from *Oviparous* ones, which lay Eggs, which after that, are hatched in living Creatures.

ULNA, or *Focile Majus*, is the greater Bone betwixt the Arm and the Wrist, which is jointed upward with the Shoulder by *Ginglymus* (which see;) and therefore it has there both *Processes* and *Cavities*; two oblong *Processes*, and as it were triangular, and rugged, that the Ligaments may knit it strongly. The foremost and uppermost is less, and goes into the Cavity of the Shoulder : The backward *Process* is thicker and larger, ends in an obtuse Angle, and enters the hinder Cavity of the Shoulder ; the *Latins* call it *Gibberus* : In the middle of these there's a great Cavity like a Semicircle.

It has yet another external lateral Cavity for the Head of the *Radius*, or lesser Bone of the *Cubitus* ; it is jointed at the lower End with the Wrist, both by a Cartilage in the Middle, and by an acute *Process*, and therefore called *Styloides*, (being like a sharp-pointed Pen used in *Writing-Tables*) whence there arises a Ligament, which fastens the *Cubitus*, and the *Joint* of the Wrist together.

UMBELICUS in an *Ellipsis*, &c. is that *Focus* about which the Motion of any Revolving Body is made, and which it respects as its Center : So that either *Focus* may be called by this Name.

UMBELLIFEROUS *Plants*, are by *Botanists* accounted, such as have their Tops branched and spread out like a *Ladies Umbrella* ; on each little Sub-division of which, there is a small Flower growing ; as *Fennel*, *Dill*, *Parsley*, &c.

This Flower is always *Pentapetalous*, and is succeeded by two naked Seeds lying joining together, which are the true Distinctions of these *Plants* from others.

The *Umbelliferous* are a very large Genus of *Plants*, and by our *Accurate Botanist*, Mr. Ray, are thus distinguished.

Umbelliferous Plants, are either,

I. Such as have a compounded Leaf, of a Triangular and *Pinnate* Form : And the Seeds of these are either,

1. Broad, flat, and plain, like Leaves almost ; as the *Spondylium*, *Pastinaca Latifolia*, *Panax Heracleum Tordylium*, *Orcofolium*, *Thyselinum*, *Apium Cicuta foliis*, *Daucus Alsaticus*, *Caroifolia*, *Anethum*, *Pucedanum*, *Thapsia*, *Ferula*, &c.

2. With a Seed more tumid, and less compressed and flat than the former : As the *Cachrys*, *Asperitium*, *Cicutaria vulgaris*, *Scandix*, *Cerrefolium*, *Myrrhis Sativa Angelica*, *Levisticum*, *Siler Montanum*, *Bulbocastanum*, *Sisyrinchium*, *Oenanthe*, *Sium*, *Pimpinella Apium*, *Cicuta*, *Vishnaga*, *Saxifraga*, *Critibum*, *Feniculum*, *Daucus Vulgaris*, *Anisum*, *Caucalcis*, *Coriandrum*, *Pastinaca Marina*, &c.

II. Such as have a simple, or an undivided Leaf, or at least one, only a little jagged : As the *Perfoliata*, *Buplerum*, *Astrantia Nigra*, *Sanicula*, and the *Seseli Ethiopicum*.

UMBELICAL *Region*, is that Part of the *Abdomen* lying round about the Navel.

UMBELICAL *Vessels*, are the *Veins*, *Arteries*, &c. that belong to the Navel, or rather are enwrapped in the *Navel-string*.

The *Navel-string* is membranous, wreathed, and unequal, arising out of the Middle of the *Abdomen*, (viz. the *Navel*) and reaching to the *Placenta Uterina* : 'Tis usually half an Ell in Length, and as thick as ones Finger. It was convenient to be so long and lax, that when the *Fetus* in the Womb grows strong, it might not break it by its sprawling and tumbling about ; and after it is born, the *Secundine*, or *After-birth*, might be drawn out the better by it.

The way that it passes from the Navel to the *Placenta*, is very unconstant ; for sometimes it goes upon the Right-hand to the Neck, which having encompassed, it defends to the *Placenta*, and sometimes it goes on the Left-hand up to the Neck, &c. Sometimes it comes not to the Neck at all, but goes first a little up towards its Breast, and then turns round its Back, and from thence passes to the *Placenta*.

The *Vessels* contain'd in this *String*, (and which are enwrapped to a common Coat, called *Funiculus*, or *Intestinulum*) are four, one *Vein*, two *Arteries*, and the *Urachus*. For as for the *Nerves* which *Verheyen* suspects to be contained in it, or the *Lacteal Vessels* which *Bidloo* thinks he has observed, I shall not reckon them among these *Vessels*, because these *Authors* speak but faintly of them.

The *Vein* is larger than the *Arteries*, and arises from the Liver of the *Fetus*, (viz. out of its *Fissure*) by the Trunk of the *Vena Porta* (of which it seems to be but a Branch) and from thence passing out of the Navel, it runs along the *Funiculus* to the *Placenta*, into which it is implanted by innumerable *Roots* ; but in its Passage it sends some little Twigs into the *Arteries*.

The *Ancients*, that thought the *Fœtus* was nourished by the *Mother's Blood* only, taught the sole Use of this *Vein* to be, to carry Blood from the *Placenta* to it : And since it has been found out, and believed that it is nourished also (if not only) by *Chyle*, or *Succus Nutritius*, some have continued the same Office to this *Vein*, and think that the *Chyle* is brought by *Lacteal Vessels* arising out of the *Placenta*, as (they say) it was brought thither by the *Mother's Lacteals*. And indeed if any certain Discovery had been made of these same *Lacteals*, we should have embraced this Opinion as the most probable. But we are not to form *Hypotheses* out of *Rational Notions* only, but much rather from what appears to the Eyes of the Dissector.

We do affirm therefore, That the *Umbelical Vein* serves for conveying to the *Fœtus* the *Nutritious Juice* separated in the *Placenta* from the *Mother's Arteries*. How this Separation is made, and how it is first of all turned into Blood, we shall consider by and by.

But together with this Juice there returns so much of the *Arterial Blood* (that comes from the *Fœtus*) as is not spent upon the Nourishment of the *Placenta*, or of the *Chorion* and *Amnios* : Which Liquors thus mixed, though by the *Umbelical Vein*, they are poured into the *Sinus* of the *Porta*, yet are they not distributed through the Liver by the usual Channels thereof only ; but by the *Venal Duct*, is the greatest Part thereof conveyed in a

direct Course and full Stream into the *Cava* about the Liver.

Besides this Vein, which is common to all Creatures, there have been observ'd in Whelps and Conies, (and may perhaps in others) two small Veins more, that arising from the fourth involving Membrane peculiar to them, pass directly from the *Umbilicus* to the Mesentery of the *Fœtus*, as the other great one does to its Liver; which may strengthen the Opinion, That the Chyle, or *Succus Nutritivus* is brought to the *Fœtus* by the *Umbilical Vein* (or *Veins*.) These Veins Dr. Needham calls *Omphalo-Mesenterice*.

In the *Funiculus* are included also two Arteries, which are not both of them together so big as the Vein: They spring out of the inner Iliacal Branches of the great Artery: (Dr. Needham judges them to be derived immediately from the Extremity of the *Aorta*, before its Division) and passing by the Sides of the Bladder, they rise up to the Navel, out of which they are conducted to the *Placenta*, in the same common Cover with the Vein and *Urachus*, with which they are twined and wreathed not unlike a Rope. I say, they are inserted into the *Placenta*, and with the Vein make a most admirable Neck-like Texture. But there is one Branch of each of them which is manifestly inserted into the *Amnios*. Dr. Harvey says, The Vein is conspicuous a pretty while before these Arteries appear.

In the Creatures mention'd in the foregoing Paragraph, there are besides these Arteries, others answering to, and accompanying the Veins called, *Omphalo-Mesenterice*, abovementioned.

Blood and Vital Spirit are not carried by them from the Mother to the *Fœtus*, as many from *Galen* have taught; but, on the contrary, Spirituous Blood is driven from the *Fœtus*, by the beating of its Heart, to the *Placenta* and the Membranes for their Refection and Nourishment; from which what Blood remains, circulates back again in the *Umbilical Vein*, together with the *Succus Nutritivus* afresh inhibited by its Capillaries dispersed in the *Placenta*. But besides Arterial Blood, there flows out of the Navel by them, part of the *Succus Nutritivus*, that was imported by the *Umbilical Vein*; namely, That of it which is more crass and cerrege, which by one Circulation through the Heart, (or it may be many) could not be changed into Blood: This Part, I say, flows out by these Arteries, which by their Branches that are dispersed through the *Amnios*, disimbugue it by their little Mouths into it: For what Use shall be declared presently.

But besides these Uses which are commonly ascribed to these *Umbilical Veins* and Arteries by Anatomists, *Verheyen* (with some Probability) assigns another.

Says he, "It is worth Inquiry, for what Purpose the Blood of the *Fœtus* is sent in such great Quantity out of its Body into the *Placenta*: Seeing, without doubt, a far less Quantity of Blood would suffice for its Nourishment: For no Part in the whole Body, if you except the Lungs and Liver, has such abundance of Blood-Vessels as the *Placenta*. This must needs be for a certain common Use, which we judge to be a-kin to the Use of the Lungs, in those who being born, enjoy a freer Air: Namely, That as these do by the Help of the Lungs plentifully draw in from the Air a certain Matter highly necessary for the feeding the Vital Flame; so in the *Fœtus*, where

"the Lungs lie idle, such like Matter being received into the Mother's Blood by her Respiration, is separated therefrom by help of the *Placenta*, and mixt with the Blood of the *Fœtus* (in the *Umbilical Vein*;) and as in the Lungs of Breathing Persons, some Heterogenous Matter is continually separated from the Blood; so in the *Placenta* certain Recrements of the Blood are deposited out of the *Umbilical Arteries* into the Veins of the Mother.

And here I shall transcribe a Material Objection, with the Answer to it, out of *Diemerbroeck*.

Objection.

How can these Vessels, (Vein and Arteries) when they have grown from the Belly of the Fœtus, to that Length as to reach the Membranes, penetrate and pass through them to the Placenta?

Answer.

This is done in the same manner as the Roots of Herbs, Shrubs and Trees penetrate into the hard Ground, yea, often into thick Plants, Walls and Stones, (which Water cannot enter) and root themselves firmly in them. For just to the first sharp-pointed and most fine ends of the *Umbilical Vessels*, insinuate themselves by little and little into the Pores of the Membranes (for the Figuration of those Pores are fitted for their Entrance) and pass through them, and yet the Liquors contained in these Membranes cannot flow out by them: And when those Vessels inhering in the Pores, grow more out into Length, by little and little, the said Pores are more and more widened, (according to the Increase of the Vessels) and are inseparably united unto, and grow in them.

The fourth *Umbilical Vessel*, is the *Urachus*, or *Urinary Vessel*. This is a small, membranous, round Pipe, endowed with a very strait Cavity arising from the bottom of the Bladder up to the Navel, out of which it passes along within the common Cover, and opens into the *Allantoides*.

It is more apparently pervious in many of the larger Brutes, than it is in Man; in whom some have denied it any Cavity; but that it is hollow in him, is confirmed by many Histories of Persons adult, who having the ordinary Urinary Passage along the *Penis* stopp'd, the Passage in this Vessel has been unlocked, and they have made Water by the Navel, which could not have been imagined to have happen'd, if it had been originally a Ligament without any *Meatus*.

Bartholin, and others have affirmed, That the *Urachus* in Men reaches no further than the Navel: How then comes that Humour into the *Allantoides*, that has perfectly the same Taste with the Urine in the Bladder? But their Error sprung from hence, That they thought a Humane *Fœtus* had no *Allantoides*; and that Humour that is found in it, they thought had been contained in the *Chorion*: But this is in short refuted above, but more fully and accurately by Dr. Needham, *Lib. de formato Fœtu*, cap. 3.

As to the Perviousness of the *Urachus*, I shall add this further, That in Abortions of five or six Months old, the Bladder of the *Embryo* is always full of Urine, out of which, if in the following Months it should not be emptied by the *Urachus*, the Bladder would soon burst, seeing there is daily some

some Serum separated from the Blood in the Kidneys, and sent to the Bladder; and the more the *Fetus* increaseth, the more must need be separated. Yea, Dr. Needham affirms, That one may either press the Liquor contained in the *Allantoides* by the *Urachus* into the Bladder, and with a Pipe blow Wind out of the Bladder by the same way into the *Allantoides*.

Its Use has been sufficiently declared in the preceding Paragraph; as also above, when we delivered the Use of the *Allantoides*, which we shall not repeat.

These four Vessels (as has been said above) have one common Cover, which also keeps each of them from touching the other: It is called *Intestinulum* and *Funiculus*, (by which it with its Vessels is sometimes understood.) It is membranous, round and hollow, indifferent thick, consisting of a double Coat, (the inner from the *Peritonæum*, and the outer from the *Panniculus carnosus*.) Sometimes it self only is wreathed about like a Rope, the Vessels included in it running streight along its Cavity; and sometimes they are wreathed together with it.

It hath several Knots upon it here and there, which Dr. Wharton thinks to be *Papillæ*, or little Glands through which the Lactal (or Nutritious Juice) distils out of the Cavity of the *Funiculus*, into the Cavity of the *Ammios*.

I cannot tell whether this be so, or no; but the Use that doting Midwives make of them to guess by their Number how many Children more the Mother shall have, and by their Colour, whether those Children shall be Male or Female, is more ridiculous than superstitious.

UMBILICK Points, in *Mathematicks*, are the same with *Focus's*; which see.

UMBILICUS, the Navel, is a Part in the Center of the *Abdomen*, to which the Navel-string in a *Fetus* is joined, which is cut off after the Delivery.

UNCIÆ, in *Algebra*, signifie those Numbers which are prefix'd before the Letters of the Members of any Power produced from a *Binomial*, *Residual*, or *Multinomial Root*.

This in the fourth Power of $a + b$; that is, $aaaa + 4 aaab + 6 aabb + 4 abbb + bbbb$, the *Unciæ* are 4, 6, 4.

The wonderful Sir Isaac Newton gives this Theorem for finding the *Unciæ* of any Power arising from a *Binomial Root*.

Let the Index of that Power be called m ; then will the *Unciæ* arise from such a continual Multiplication as this, viz.

$$1 \times \frac{m-0}{1} \times \frac{m-1}{2} \times \frac{m-2}{3} \times \frac{m-3}{4} \times \frac{m-4}{5} \times \dots, \text{ \&c.}$$

Thus if the *Unciæ* of the *Biquadræ*, or fourth Power were required; the Rule is,

$$1 \times \frac{4-0}{1} (=4) \times \frac{4-1}{2} (=6) \times \frac{4-2}{3} (=4) \times \frac{4-3}{4} (=1)$$

Which shews, that the *Unciæ* are 1, 4, 6, 4, 1.

UNCORE *Prise*, in Law, is a Plea for the Defendant, being sued for a Debt due at a Day past,

to save the Forfeiture of his Bond, saying, That he rendered the Debt at the Time and Place, and that there was none to receive, and that he is still ready to pay the same.

UNDIMIA, the same with *Oedema*.

UNGUIS, a Nail, is a simular, flexible, white, and hard Part, which defends the Fingers from external Injuries, and in some measure adorns them. The Root of it is joined to a certain Ligament, and by reason of the neighbouring Tendons it becomes sensible: They seem to be made of a Collection of very little Pipes, which adhere extremely thick to one another, and shoot out into length, Where they begin, there you find certain nervous Fibres like so many small Nipples lengthen'd, the lengthen'd Parts whereof, are seen as far as the Nail: If they be forcibly torn off, they leave divers Holes, so that the Horney Substance of the Nails looks like a Net. Under the Nails there's a pappy sort of Body, which has its Vessels of Excretion.

The *Apices*, or Tops of the Nails, are they which grow beyond the Flesh; the Parts which are out, are called the *Segmina*, the Paring of the Nails; the Parts under the Nails, are the *unguia*, the hidden Parts; the white Semi-lunar Part next the Root, is the Rife of the Nail; the very Beginnings that grow into the Skin, are call'd the Roots of the Nail; the Sides, the Clefts; the white Spots, *Nubeculae*, little Clouds, &c. *Blanchard*.

UNGUIS, the same with *Hypopyon*; which see.

UNGUIS Os, is a little thin Bone, which lies in the great Angle of the Orbit of the Eye, it has a Hole in which the Lachrymal Glands lies.

UNGULA, is a sort of hooked Instrument used by Surgeons, to draw a dead *Fetus* out of the Womb.

UNIFORM *Motions* are the same with equal, or rather *Equable ones*; which see.

UNIFORM *Flowers* of Plants, the Botanists call such as are all round of the same Figure; or whose fore and back Part, and whose right and left Parts are exactly alike; but when they are not so, they call them *Difform Flowers*.

UNION, (a Term among Painters) is the mutual Agreeableness and Sympathy of the Colours in a Piece of Painting.

UNION, Dr. Grew makes Union in a Physical Sense, to be one of the three Ways of Mixture; and he defines it to be, the Union of Atoms, or Particles which touch in a Plain; as in the Crystallization of Salts, and other like Bodies.

UNION, in Musick, is one of the same Sound, whether produced by one single Voice, or divers Voices sounding in the same Tone; so that an *Unison* in this Science, may be considered as an Unite in Arithmetick, or as a Point in Geometry, not divisible into any Parts, in regard that it is the first Term to any Interval. When the Ancients divided their *Monochord*, so that the Parts were as 1 to 1, they called them *Unisons*.

UNITE, is the same with the Figure 1, being one single individual Part of discreet Quantity. If a Number consist of 4 or 5 Places, that which is outermost towards the Right-hand, is called the Place of *Unites*.

Number in general, is by *Euclid* defined to be *univ. sive numeros*, a Multitude, or Aggregate of *Unites*; and in this Sense *Unity* is not a Number. But *Unity*, as it may be taken for an Individual

Unite,

Unite, is certainly as much a Number as 10, 20, 100, &c.

UNITY of *Possession*, in the Civil Law, is called, *Consolidatio fructus & proprietatis*, and signifies *Joint Possession* of two Rights by several Titles.

As for Example : If I take a Lease of Land from one upon a certain Rent, and afterwards I buy the Fee-simple, this is an *Unity of Possession*, by which the Lease is extinguished, by reason that I, which before had the Occupation only for my Rent, am become Lord of the same, and am to pay my Rent to none but my self.

UNIVERSAL Equinoctial Dial, is made of two Rings of Brass or Silver, that open and fold together, with a Bridge or Axis, and a Slider, and a little Ring to hang or hold it up by : It is divided on one side of the great Ring into 90 Degrees, and sometimes on the other into two Quadrants, or 180 Degrees, but one is enough : The innermost Ring is divided into 24 Hours, sub-divided on the Face, and on the outside of the Ring, into every five Minutes. The Axis has the Sun's Declination on one side, and the Days of the Month and the Sun's Place on the other.

To use it for the Hour, the Perpendicular Line or Stroke which is on the Slider, which moves on the outer Ring, must be set to the Latitude of the Place, and the Hole in the Slider on the Bridge either to the Sun's Place in the Ecliptick, the Day of the Month, or his Declination ; and then the Rings being opened, and set square to one another, move the Dial about two and fro, 'till the Sun shine through the Hole, and on the inner Edge of the innermost Ring, and there it will shew the true Hour.



UNIVOCAL Terms in Logick, are such whose Name and Nature is the same ; and 'tis used in Opposition to Equivocals, whose Names are the same, but their Natures very different ; for a Thing to be predicated *Univocally* of any others, is to be attributed to all of them alike, and in the same proper Sense.

UNLAWFUL *Assembly*, is the Meeting of three or more Persons together, by Force, to commit some unlawful Act, and so abiding together, tho' not endeavouring the Execution of it, as to assault, or beat any Person, to enter into his House, or Land, &c.

UNLIKE Quantities and Signs in *Algebra* : See like Signs and Quantities.

UNLIMITED Problem (*Inordonné*) according to Mr. *Ozanam*, is such a Problem in *Mathematicks*, as is capable of *Infinite Solutions* : As to di-

vide a Triangle given into two equal Parts, to make a Circle pass through two Points assigned, &c.

UNQUES *Prist*, in Law, is a Plea whereby a Man professeth himself *always* ready to do or perform that which the Defendant requires : As if a Woman sues the Tenant for her Dower, and he coming in at the Day offers to averr, That he was *always* ready, and still is to perform it In this Case, except the Demandant shall averr the contrary, he shall recover no Damages : When this Plea will serve to avoid Charges, and when not : See *Kitchin*, fol. 243.

VOCAL Nerves, the same with *Recurrent* ; which see.

VOID *Bastion* : See *Bastion*.

VOIDED, a Term in Heraldry, when there are Lines drawn within, and parallel to the Out-lines of any Ordinary : This expresses an Exemption of something of the Thing voidable, and makes the Field appear transparent thro' the Charge.



VOIDER, so the Heralds call one of the *Ordinaries*, whose Figure is much like that of the *Flasque* or *Flanch*, only it does not bend or bow in so much : This Armour they say, is the Reward of a Gentlewoman that has well served her Prince. They are always born by Pairs.

The Field is *Tenn*, two *Voids*, or.

VOIR *dire*, is when 'tis pray'd upon a Trial at Law, that a Witness may be sworn upon *Voir dire* ; the Meaning is, he shall upon his Oath speak or declare the Truth, whether he shall get or lose by the Matter in Controversie ; and if he be unconcern'd, his Testimony is allowed, otherwise not.

VOLATILE Salt of *Vegetables* is usually drawn into a Retort from the Fruits and Seeds fermented, and seems to be only the *Essential Salt* driven up higher, and Volatilized by the Spirits during the Fermentation and Distillation.

The *Volatile Salt* of *Animals*, is drawn much the same way as that of *Vegetables*.

VOLATILE Spirit of *Sal Armoniack*, is made either by mixing *Quick-lime*, or Salt of *Tartar*, with *Sal Armoniack*, and then pouring a sufficient Quantity of Water upon it, the Matter is distilled in a Retort when *Quick-lime* is used, otherwise in a Glass Body, or *Cucurbit* ; by this means the Lime or the Salt of *Tartar* doth destroy the Strength of the Acid Sea Salt, that held bound and fixt the *Volatile Salts* of *Urine* and *Soot* of which *Sal Armoniack* is made ; whereby they being at Liberty are driven out by the Fire, and dissolved in the Water that was poured on the Mixture, and so compose this *Volatile Salt*.

Spirit of *Sal Armoniack* made with *Quick-lime*, is an excellent Thing to make *Precipitations* with ; destroying all kinds of Acids almost, and is used to precipitate Solutions of Gold.

If you mix together equal Parts of this Spirit made with *Tartar*, and of Spirit of *Wine*, a *Coagulum* will arise on their being shaken together ; but not if you use the Spirit of *Sal Armoniack* made with *Quick-lime*.

If after either of these Mixtures to make Spirit of *Sal Armoniack* be put into the Body or Retort, Spirit of *Wine* be poured on, and then the Spirit drawn off ; this is called Spirit of *Sal Armoniack* dulcified.

VOLA-

VOLATILE Spirit, is a *Volatile Salt* dissolved in a sufficient Quantity of Phlegm or Water.

VOLATILES are (by some made) a Species of Animals which fly in the Air, as Birds do.

VOLATILITY, is the Property of such mixt Bodies, whose Corpuscles or Particles, of which they are composed, will rise up by that Degree of Heat, as is proper to sublime it.

Mr. Boyle, in his Notes about the Mechanical Production of this Quality of *Volatility*, supposes, or rather proves these four Attributes, or Qualifications, requisite to denominate a Body Volatile.

1. That its constituent Particles, or Corpuscles, be very small; for besides that such Minute Parts are more easily put into Motion by the Action of Fire and Heat, and consequently are more apt to be elevated, than other Parts which are more gross; these can continue their Motion upwards with less Resistance, and with a less Tendency, to descend down by their own Gravity. Wherefore,

2. 'Tis necessary that the Corpuscles of Volatile Bodies, should not only be very small, but they must also not be too solid and heavy; for the great Specifick Weight of such Bodies will hinder them from rising.

3. 'Tis necessary also, that they be conveniently *sloped* for Motion; for if they be of hooked, branched, or any other irregular and catching Figure, tho' they may be both very small and light, yet they will be apt to be entangled one in another, or to hang or stick to other Bodies; and this probably is the Reason why Water is more easily elevated by Heat, and brought to exhale than Oil, tho' it be specifically heavier than it, and its likely hath its Parts smaller too.

4. 'Tis necessary that the Parts do not too closely adhere to one another, so as on that account to be indisposed for the Separation by the Heat of an ordinary Degree of Fire.

And this Honourable Gentleman largely shews, that this Quality of *Volatility* is producible by such Mechanical Means as will produce some or all of the Qualifications above-mentioned.

VOLITION, is an Act of the Mind, knowingly exerting that Dominion it takes it self to have over any Part of the Man, by employing it in, or with-holding it from any particular Action.

VOLSELIA, or *Vulsella*, is an Instrument to pull up Hairs with by their Roots, the same with Tweezers, or a Chyrurgeon's little Tongs, which are of different Shape according to the Diversity of their Use.

VOLUMUS, is the first Word of a Clause in the King's Writs of Protection and Letters-Patents.

Of Protections, some are *Cum clausula Volumus*; and of these there are four Kinds, viz.

1. *Quia Profecturus.*
2. *Quia Moraturus.*
3. *Quia indebitatus nobis existit.*
5. When any one sent out into the King's Service beyond Sea in War, is imprisoned.

VOLUNT, a Law Term, is when the Tenant holds at the Will of the Lessor, or Lord, and that is in two ways.

First, When I make a Lease to a Man of Lands to hold at my *Will*, then I may put him out when I please; but if he sow the Ground, and I put him out, then he shall have his Corn with Egges and Regrets, 'till it be ripe to cut and carry it out of the Ground; and such Tenant at *Will*, is not bound to repair and sustain the House as Tenant for Years is: But if he make wilful Waste, the Lessor shall have against him an Action of *Trespasi*.

The other Tenant at *Will*, of the Lord, is by Copy of Court-Roll, according to the Custom of the Mannor; and such a Tenant may surrender the Land into the Hands of the Lord, according to the Custom, to the Use of another for Life, in Fee, or in Tail; and then he shall take the Land of the Lord, or his Steward, by Copy, and shall make Fine to the Lord.

VOLUTA, in Architecture, is that Part of the Capitals of the *Ionick*, *Corinthian*, and *Composite* Orders, which is supposed to represent the Bark of Trees twisted, and turned into Spiral Lines; or, as some say, the Head-dresses of Virgins in their long Hair. *Voluta's* are different in these three Orders: Those that appear above the Stems in the *Corinthian* Order (according to *Vitruvius*) are 16 in Number in every Capital, whereas there are only 4 in the *Ionick* Order, and 8 in the *Composite*. But these *Voluta's* are more especially remarkable in the *Ionick* Capital, representing a kind of Pillow or Cushion laid between the *Abacus* and the *Echinus*, as if it were to be fear'd lest the Weight of the *Abacus*, or of the *Entablature* above it, might break or deface the *Echinus*; whence the same Ancient Architect took Occasion to call the *Voluta*, *Pulvinus*, or Bolster.

VOLVULUS: See *Ileon* and *Chordapfus*.

VOMER, is a Bone situated in the Middle of the lower Part of the Nose. It has a Cleft in the upper Side, in which Cleft it receives the lower Edge of the *Septum Nasi*. In its further End it receives a small *Apophyse* of the *Sphenoides*, and its under Side joins the *Os Palari*.

VOMICA, is a Fault in the Lungs, from Heterogeneous Blood, which lodged perhaps in one of the little Bladders, or Cells there, occasions neither a Fever nor a Cough; but afterward, when it is encreased, it oppresses the neighbouring Sanguiferous Vessels, and impregnates the Blood as it passes along with its *Effluviuims*; whereupon there succeeds a small Fever, accompanied with Inquietude and Leannels; at last when it is full grown and concocted into Matter, it makes a Nest as it were, and lodges there. *Blanchard*.

VORTEX, according to the *Cartesian* Philosophy, is a System of Particles of Matter moving round like a Whirl-pool, and having no void Interstices, or Vacuities between the Particles. This Vortex thus moving round, will occasion any Bodies that swim in the System, to move round as that doth, and that swifter or slower, according as they are farther off, or nearer to the Centre.

By such *Vortices* as these, they endeavour to solve the Motion of the Heavenly Bodies round the Sun in the Centre of the Vortex. But the Excellent Sir *Isaac Newton* had demonstrated, That the Planets cannot be carried round their Centre by the Motion of any *Corporeal Vortex*: Because if they

they were, the Vortices themselves must be carried round after the same manner as Astronomers have discovered that the Planets perform their Revolutions; which is so, that their Periodical Times are always in a *Sesquialteral Ratio* of their Distances from their Centres; or that the *Squares* of the Times of their Periodical Revolutions are as the *Cubes* of their middle Distances from their Centres.

But he proves, That the Periodical Times of the Parts of the Vortex will always be only as the Squares of their Distances from the Centre of their Motion.

Besides, the Planets, according to the true *Copernican Hypothesis*, being carried about the Sun in Ellipses, and having the Sun in the *Umbilicus* of each Figure, by Lines drawn from themselves to the Sun, do always describe Areas proportional to the Times of their Revolutions, which he shews, the Parts of no Vortex can do: See *Scol. Prop. ult. Lib. 2. Princip.*

Again, as the Ingenious Mr. Keil observes in his Examination of *Dr. Burnet's Theory*: If the Earth were carried in a Vortex, it would move faster, in the Proportion of 3 to 2, when it is in *Virgo*, than when it is in *Pisces*, which all Experience proves to be false: See a large Refutation of all the *Cartesian* Doctrine of the Vortices in *Dr. Gregory's Astronom. Phys. & Geometr. Lib. 1. Sect. 10.*

VOUCHER, is a Term in Law, signifying when the Tenant calls another into the Court, that is Bound to him to Warranty: And 'tis either to defend the Right against the Demandant, or to yield him other Lands, &c. in Value, and extend to Lands or Tenements, of Freehold or Inheritance: And it seems in some measure to agree to the Contract in the Civil Law, whereby the Vendee bindeth the Vendor, sometimes in the simple Value of the Things bought, sometime in the double, to *Warrant* the secure enjoying the Thing bought; yet there is this Difference between the *Civil*, and the *Common Law*, that the *Civil Law* binds every Man to warrant the Security of that which he selleth, which the *Common Law* doth not, except it be specially covenanted.

The Process whereby the *Vouchee* is called, is a *Summons ad Warrantandum*: And if the Sheriff return upon that Writ, that the Party hath nothing whereby he may be summoned, then goes out another Writ called, *Sequentur sub suo periculo*

A Recovery with a *single Voucher*, is, when there is but one *Voucher*: And with a *double Voucher*, is, when the *Vouchee* voucheth over, and so a *treble Voucher*.

There is also a *Foreign Voucher*, when the Tenant being impleaded in a particular Jurisdiction of that Court, which might more aptly be called a *Voucher* of a Foreign.

Voucher signifies also a *Leiger-Book*, or Book of Accompt, wherein are entered the Acquittances or Warrants for the Accomptant's Discharge.

VOYDANCE, is a Want of an Incumbent upon a Benefice, and this double, either in Law, as when a Man hath more Benefices incompatible; or in *Deed*, as when the Incumbent is dead, or actually deprived.

UPRIGHT *South Dyals*: See *Prime Verticals*.

URACHUS, is one of the Umbilical Vessels, being a small Membranous round Pipe, with a very strait Cavity arising from the bottom of the Bladder up to the Navel, out of which it passes along with the common Cover, and opens into

the *Allantoides* of the *Fetus*: 'Tis more pervious in some of the larger Brutes than in Men, in whom some have denied it to be hollow; but that seems contradicted by the Instances we have had of Mens making Water by the Navel, when the Passage of the *Penis* hath been quite stopped. *Bartholin* and some others say, That the *Urachus* in Men reaches no farther than the Navel: But how then comes that Humour into the *Allantoides*, which has perfectly the same Taste with the Urine in the Bladder? The Mistake seems to arise from that wrong Notion, That a *Humane Fetus* hath no *Allantois*, which hath been by *Needham* and others sufficiently refuted.

The Use of the *Urachus* is to convey the Urine from the Bladder of the *Fetus* into the *Allantoides*, which is placed between the *Chorion* and the *Amnion*.

URETER, is a *Fistulous Membranaceous Vessel*, which proceeds from both Reins, and opens between the Membranes of the Bladder, by which the Urine passes from the Reins to the Bladder; *Celsus* calls it the *White Vein*.

URETHRA, or *Fistula*, is the Urinary Passage, whereby the Urine is discharged: It serves in Males also for the Ejection of the Semen. The Seminal little Bladders empty themselves into it by 2 Holes at the beginning of it, when there is occasion; which Bladders or Vessels are surrounded with Glandulous Prostates, perforated with several Holes, to which there is a little piece of Flesh affixed. *Blanchard*.

Mr. *Comper* observes, That the *Urethra* hath a *Corpus Cavernosum*, like to that of the *Penis*, which you will find described under the Words *Corpora Cavernosa*; but this of the *Urethra*, differs much in Figure from them: The superior Part of this *Corpus Cavernosum* lying between the two *Crura* of the former, he calls *Bulbus*, from its Figure; it is covered with the *Musculus Accelerator Urinae*; it possesseth all the lower Part of the *Urethra*, extending its self in the *Perineum*; it hath moreover, a *Septum Intermedium* (tho' not taken Notice of by Anatomists) dividing the right Side of the *Bulbus* from the left, which descending to the End of the *Bulbous Part*, is there obliterated.

The Use of this *Septum* is (as Mr. *Comper* thinks) to direct the *Refluent Blood* to the exporting Ducts, its two Veins that carry the *Blood back*.

As this *Corpus Cavernosum* descends on the inferior Part of the *Urethra*, it is lessened; but when it approaches the Extremities of the two other *Corpora Cavernosa* it again dilates it self and covers them, composing that Body which they call the *Glans* or *Balanus*.

URINOUS Salts, are that Tribe of Volatile Salts drawn from Animal, or other Substances that are contrary to Acids: And Mr. *Boyle* says, They are distinguishable from *Lixiviat Salts*, by this Test, That they will turn a Solution of Sublimate into a *White Colour*, whereas *Lixiviate Salts* turn it into a *Yellow one*.

URSA *Major*, a Northern Constellation, consisting of 27 Stars, and is otherwise called *Charles's Wain*, and the *Great Bear*.

USAGE: See *Prescription*.

USE, in Law, properly signifies the Profits or Benefits of Lands or Tenements: For every Deed consists of 2 principal Parts; namely, *The Premises*, and the *Consequents*.

The Premises, is the former Part thereof, being all that which precedeth the *Habendum*, or Limitation of the *Estate*, which are the Persons contracting, and the Thing contracted.

The Consequent is that which follows the *Premises*, and that is the *Habendum*, in which are two Limitations: The one of the *Estate* or Property, which the Party Passive shall receive by the Deed: The other of the *Use*; which is to express in the said *Habendum*, to or for what *Use* and Benefit he shall have the same *Estate*, and of the Limitation of such *Uses* many Precedents are set down in Law Books.

USER de Añion, a Term in Law, signifying the pursuing or bringing an *Añion*, which in what Place and Country it ought to be; See *Bro. tit. Lieu and Country*, Fol. 64.

USUCAPTION, in Law, signifies the enjoying a Thing by continuance of Time, or receiving the Profits, long Possession or Prescription.

USURY, is the Gain of any thing above the Principal, or that which was lent; exact only in Consideration of the Loan, whether it be Money, Corn, Apparel, Wares, or such like.

UTERUS, the Womb, an Organical Part, wherein Generation and Conception are made, being seated in the *Hypogastrium*.

UTLAGATIO Viri.

UTLAGATO *capiendo quando utlagatur in uno comitatu & postea fugis in alium*, is a Writ, the Nature whereof is sufficiently exprest by the Name.

UTLARY, or *Utlawry*, is a Punishment for such as being called into Law, and lawfully sought, do contemptuously refuse to appear after an *Original Writ*, with a *nihil habet*, three Writs of *Capias*, *Alias* & *Pluries*, returned by the Sheriff *non est inventus*, and an *Exigent* with a Proclamation, thereupon awarded. And *Bracton* says, he must be called at five Counties, a Month between every County; and if he appear not within that Time, he shall be pronounced out of the King's Protection, and deprived of the Benefit of the Law. The Effect of this is divers; for if he be *Outlawed* at the Suit of another in a civil Cause, he shall forfeit all his Goods and Chattels to the King. If upon Felony, then he shall forfeit all his Lands and Tenements which he hath in Fee, or for Life, and his Goods and Chattels. A Minor nor Woman cannot be *Outlawed*: For where a Man is said to be *Outlawed*, a Woman is termed *Waived*.

UTRUM: See *Affise*.

UTTER-BARRISTERS, are such, who for their long Study, and great Industry bestowed upon the Knowledge of the Common Law, are called from their Contemplation to Practice, and in the Face of the World, to take upon them the Protection and Defence of Clients; the Time before any ought to be called to the Bar, was formerly eight Years, but now reduced to seven; and the Exercises done by him (if he were not called, *Ex gratia*) was Twelve *Grand Moats* performed in the Inns of Chancery, in the Time of the Grand Readings, and Twenty four *Petty Moats*, at the Inns of Chancery, in the Term-times, before the Readers of the respective Inns of Chancery.

A *Barrister* newly called, is to attend the six next long Vacations, the Exercises of the House, *viz.* in *Lent* and *Summer*, and is therefore for those three Years called, a *Vacation-Barrister*.

And they are also called, *Utter-Barristers*, *i. e.* Pleaders without the Bar, to distinguish them from Benchers, or those that have been Readers, who are sometimes admitted to plead within the Bar, as the King's, Queen's, or Prince's Council are.

UVA, the same with *Cion*; which see.

UVEA Membrana sive Tunica, is the Fore-part of the *Choroides*; being almost altogether continuous on the Inside to the *Tunica Sclerotic*; it is perforated in the Fore-part, and leaves a Space for the Apple of the Eye, which may be contracted or dilated: Its exterior Surface is of various Colours, whence it is called *Iris*, and in this is the Difference of Mens Eyes as to Colour; as Black, Grey, &c. The Inside of this Uveous Tunick is cover'd with a Black Lining, that the Cavity of the Eye may be the darker.

UVIGENA, or *UVIGERA*, the same with *Cion*.

VULGAR Fractions: See *Fractions*.

VULTUR Volans: See *Aquila*.

UVULA, is a double Production of the Internal Membrane of the Mouth; its Substance is very lax, and it has a Number of small Glands as in the Palate: It is somewhat long and of a Conick Figure: It hangs from the Roof of the Mouth near the Passage which comes from the Nose, above the Seat of the Larynx between the Tonfils: It is moved by 2 Pair of Muscles, called *Pterigostaphilinus Externus* & *Internus*: Its Use is to hinder Drink, &c. from falling down into the *Aspera Arteria*.

W A K

WADHOOK, among the Gunners, is a Rod or great Wyre of Iron, turn'd in a Serpentine manner; and in its End, is put upon a Handle or Staff, to draw out *Wads* or *Okum*, that the Piece may be unloaded.

WAF: To waft a Ship, is to convey her safe, as Men of War do by Merchants Ships. But to *make a Waft*, is to hang out some Coat, Sea-gown, or the like, in the main Shrowds of the Ship, as a Sign for Men to come on Board, &c. And often such a *Waft*, is a Sign a Ship is in great Danger by a Leak, &c. and therefore wants Help from the Shore, or from some other Ship.

WAGONER: See *Charles Wayn*.

WAI*FE*, or *Weyfe*, is, when a Thief having feloniously stolen Goods, and being nearly followed with *Huy and Cry*, or else overcharged with the Burden or Trouble of the Goods; for his own Ease, and more speedy Flight, flies away and leaves the Goods behind him; then the King's Officer, or the Bailiff of the Lord of the Mannor, (within whose Jurisdiction they be left) who by Prescription or Grant from the King, hath the Franchise of *Waife*, may seize the Goods for waiv'd his Lord's Ufe, except the Owner come with fresh Suit after the Felon, and sue an Appeal within a Year and a Day, or give Evidence against him at his Arraignment, &c. In which Cases, the first Owner shall have Restitution of his Goods so stolen and *waived*. *Waifes* also signifie Things lost, and Estrays, which must by the Lord of the Franchise where they are found, be cauled to be Cried and Published in Markets and Churches near about, else the Year and Day does not run to the Prejudice of the Lifer.

WAI*VE*, is a Woman that is Outlaw'd; and she is called *Waive*, as forsaken of the Law, and not an *Outlaw*, as a Man is; for Women are not Sworn in Leets to the King, nor to the Law, as Men are, who therefore are within the Law; whereas Women are not, and for that Cause they cannot be *Outlawed*, since they never were within it.

WAKE of a Ship, is the smooth Water that runs from a Ship's Stern, when she is under Sail. This is also called her Wake; and by it a good Guess may be made of the *Speed* she makes. And particularly, they judge from this *Wake*, whether a Ship go *as she looks*, (as they expect it) *i. e.* whether she makes her Way right as her Head lies, as the doth, when her *Wake is right a Stern*: But if this *Wake* be a Point or two to Leeward, they judge that she slides and falls to the Leeward of her Course.

They say also, when a Ship *lays a Weather of Wake*; that is, when in her Slaying, she is so quick, that she don't fall to Leeward upon a Tack, but that when she is tack'd, her *Wake* is to Leeward; then 'tis a Sign that she feels her Helm very well, and is nimble of Steerage.

Also, when one Ship giving Chase to another, is got as far into the Wind as she, and sails directly after her, they say, *She is got into her Wake*.

WALE, or *Wail*; a Term at Sea for those utmost Timbers in Ship's Side, on which Men set

W A R

their Feet when they clamber up a Ship's Side. These are reckoned from the Water, and called her 1st, 2d, or 3d *Wale* or *Bend*.

WALE-Knot, is a round Knot or Knob made with three Strands of a Rope, so that it cannot slip, by which (in a Ship) the *Tacks*, *Top-sail Sheets*, and *Stoppers* are made fast: As also, some other Ropes.

WALE-Reared; so the Seamen call a Ship, when after she comes to her Bearing, she is not narrow in her upper Work, nor *bowed in*, as their Word is, but is built straight up. Which Way of Building, tho' it don't look well, nor is, as they say, *Ship-shaken*, yet it hath this Advantage, That a Ship is thereby more *Roomy* within-board; that is, she is larger within, and also becomes thereby a *Holsum Ship in the Sea*, especially if her Bearing be well laid out.

WALT; a Ship is *Walt*, when she hath not her due Ballast, *i. e.* not enough to enable her to bear her Sails.

WALVIARIA *Mulieris*, a Term in Law, signifying as much as *Ulagatio Viri*, or the Outlawing of a Man: See *Ulagation*.

WAPP, is that Rope in a Ship wherewith the Shrowds are set taught with *Wale-knots*; one End is made fast to the Shrowds, and to the other are brought the Laniards.

WARD, is a Word that has divers Significations; as a *Ward* in London, is a Portion of the City committed to the special Charge of one of the Aldermen of the City. Also, a Forest is divided into *Wards*. And a Prison is called a *Ward*. As also, the Heir of the King's Tenant, that held by Knight's Service, or in *Capite*, was called a *Ward* during his Nonage. But this last is taken away by the *Stat. 12. Car. 2. cap. 24*.

WARDEN, being the same with Guardian, but is commonly used for him that hath the Custody and Charge of any Person or Thing, by Office.

WARNING-Wheel, in a Clock, is the *Third* or *Fourth Wheel*, (according to its Distance from the *First Wheel*.)

WARP; to *warp* a Ship, is to hale her up by a Hawser, or any other Rope, (sufficient for that purpose) with an Anchor bent to it. It's used when a Wind is wanting to carry her into, or out of a Harbour; and this is termed *Warping*; and the Hawser, or any Rope sufficient, and used to hale her up, is called a *Warp*.

WARRANT of Attorney, is that whereby a Man appoints another to do something in his Name, and warranteth his Action. It seems to differ from a *Letter of Attorney*, which passeth usually under the Hand and Seal of him that makes it before any creditable Witnesses; whereas a *Warrant of Attorney*, in Personal, Mixt, and some Real Actions, is put in of course by the Attornies, for the Plaintiffs or Demandants, Tenants or Defendants. But a *Warrant of Attorney* to suffer a Common Recovery by the Tenant or Vouchee, is acknowledged before such Persons, as a Commission for the doing thereof directs.

WAR-

WARRANTIA Charta, is a Writ that lies for him, who being infeoff'd in Lands or Tenements with a Clause of Warranty, and is-impleaded in an *Affize*, or *Writ of Entry*, wherein he cannot Vouch or Call to *Warranty*: For in this Case his Remedy is to take out this Writ against the Feoffor or his Heirs.

WARRANTIA Diei, is a Writ lying in Case where a Man having a Day assign'd Personally to appear in Court to any Action wherein he is Sued, is in the mean Time, by Commandment, employ'd in the King's Service, so that he cannot come at the Day assign'd; this Writ is directed to the Justices, to the End that they may neither take, nor record him in Default for that Day.

WARRANTY, is a Promise or Covenant by Deed made by the Bargainer, for himself and his Heirs, to warrant or secure the Bargainee and his Heirs, against all Men, for the enjoying any thing agreed on between them, and this *Warranty* passeth from the Seller to the Buyer, from the Feoffor to the Feoffee, from him that releaseth, to him that is released from an Action real, and such like. *Warranty*, is either *real* or *personal*: *Real*, when it is annexed to Lands or Tenements granted for Life, &c. And this is either in *Deed*, or in *Law*: *Personal*, which either respects the Property of the Thing sold, or the Quality of it. *Real Warranty*, in respect of the Estate, is either *Lineal*, *Collateral*, or *commencing by Disseisin*; of which *Littleton* gives an Account in the last Chapter of his Tenure.

WASTE Boards, are Boards sometimes set upon the Sides of a Boat, to keep the Sea from breaking into her.

WASTE-Cloths, are Cloths hung up on the uppermost Work of a Ship's Hull, to shadow the Men from an Enemy in the Fight; and therefore by some they are called *Fights*.

WASTE-Trees, are those Timbers of a Ship which lie in the Waste.

WASTE of a Ship, is that Part of her between the two Masts, i. e. between the *Main-mast* and the *Fore-mast*.

WASTE, in Law, hath divers Significations.

First, It is a Spoil, made either in Houses, Woods, Lands, &c. by the Tenant for Life, or Years to the Prejudice of the Heir, or of him in Reversion or Remainder; whereupon the *Writ of Waste* is brought for the Recovery of the Thing wasted, and treble Damages.

Waste of the Forest, is most properly where a Man cuts down his own Woods within the Forest, without Licence of the King, or Lord-Chief-Justice in Eyre.

Secondly, *Waste* is taken for those Lands, which are not in any Man's Occupation, but lie common; which seem to be so called, because the Lord cannot make such Profit of them, as of his other Lands, by reason of that Use which others have of it, in passing to and fro: Upon this none may build, cut down Trees, dig, &c. without the Lord's Licence.

WATCH, at Sea, signifies the Space of 4 Hours, because half the Company or Crew watch and do Duty in their Turns, so long at a Time. All a Ship's Company is divided into two Parts, the *Larboard* and the *Starboard* Watch. The *Master* of the Ship Commands the latter, and the *Chief Mate* the former. Sometimes, when a Ship is in Harbour, they watch but a *Quarter-watch*, as they call it;

that is, but a quarter of the Company watch at a Time; because they have then but little to do, or look after.

WATCH-Glass, being four Hours, is used at Sea, to shift or change their Watches. There are also *Half-watches*, *Hour-glasses*, *Minute*, and *half Minute-glasses*; by which last, they count the Knots when they leave the Log, in order to find the Ship's Way.

WATCH-work, is the internal Parts of any Movement or Watch, which is designed to shew the Hour, or any other Division of Time without Striking; for whatever is contrived to produce that Effect, is called *Clock-work*; and that Part of the Movement is called the *Striking-part*.

The general Rules for the Calculation of *Watch-work*, are reducible to these Heads.

1. 'Tis certain that the same Motion may be perform'd either with one Wheel and one Pinion, or by many Wheels and many Pinions, provided that the Number of Turns of all those Wheels bear the Proportion to all those Pinions, which that one Wheel bears to its Pinion; or (which is the same thing) that the Number produced by multiplying all the Wheels together, be to the Number produced by multiplying all the Pinions together, as that one Wheel is to that one Pinion.

Thus, suppose you had Use for a Wheel of 1440 Teeth, with a Pinion of 28 Leaves, you may make it into three Wheels and Pinions, viz.

$$4) 36, 7) 8, 1) 5.$$

For if the three Wheels 36, 8 and 5, be multiply'd together, 'twill give 1440 for the Wheels, and if the 3 Pinions 4, 7 and 1, be also multiplied together, you'll have 28 for the Pinions.

It matters not in what Order the Wheels and Pinions are set, or which Pinion runs in which Wheel; only for Contrivance sake, the biggest Numbers are commonly set to drive the rest.

2. Two Wheels and Pinions of different Numbers may perform the same Motion. As a Wheel of 36 drives a Pinion of 4, all one as a Wheel of 45 drives a Pinion of 5; or a Wheel of 90 drives a Pinion of 10. The Turns of each are 9.

3. If in breaking your Train into Parcels, any of your Quotients should not please you; or if you would alter any other two Numbers which are to be multiplied together, you may vary them by this Rule. Divide your two Numbers by any two other Numbers which will measure them; then multiply the Quotients by the alternate Divisors; the Product of these two last Numbers found, shall be equal to the Product of the two Numbers first given.

Thus, if you would vary 36 times 8, divide these by any two Numbers that will evenly measure them; as 36 by 4, it gives 9; and 8 by 1, it gives 8; now (by the Rule) 9 times 1 is 9, and 8 times 4 is 32: (See the Operation.)

$$\begin{array}{r} 9 \quad 8 \\ 36 \times 8 \\ \hline 4 \quad 1 \\ 32 \times 9 \end{array}$$

So that for 36×8 , you have 32×9 , which is equal to it, and each equal to 288.

And if you Divide 36 by 6, and 8 by 2, then Multiply, as before is said, you'll have $24 \times 12 = 36 \times 8 = 288$.

$$\begin{array}{r} 6 \quad 4 \\ 36 \times 8 \\ \hline 6 \quad 2 \\ 24 \times 12 \end{array}$$

4. If it happens that you have a Wheel and Pinion fall out with cross Numbers, too big to be cut in Wheels, and yet not to be altered by the former Rules; then in seeking for your Pinion of Report, you may find out two Numbers of the same, or a near Proportion, by this Rule, viz. As either of the two given Numbers Is to the other :: So is 360 To a fourth. Divide that fourth Number, as also 360 by 4, 5, 6, 8, 9, 10, 12, 15, (each of which Numbers doth exactly measure 360) or by any one of those Numbers that bringeth a Quotient nearest to an Integer.

As suppose you had these two Numbers, 147 the Wheel, and 170 the Pinion, which are too great to be cut into small Wheels, and yet cannot be reduced into less, because they have no other common Measure, but Unity; Say therefore, As 170 : 147 :: 360 : 311. Or as 147 : 170 :: 360 : 416. Divide the 4th Number, and 360 by one of the foregoing Numbers;

- 6) 311 (52 as 311 and 360 by 6, it gives 52
360 (60 and 60; Divide them by 8, you
8) 311 (39 will have 39 and 45. Also, if you
360 (45 Divide 360 and 416 by 8, you'll
have 45 and 52 exactly. Where-

fore instead of the two Numbers 147 and 170, you may take 52 and 60, or 39 and 45, or 45 and 52, &c.

5. When you come to Practice in Calculating a Piece of Watch-work, the first thing you are to do, is, to pitch upon your Train or Beats of the Balance in an Hour; as whether a swift Train, of about 20000 Beats, (which is the usual Train of a common 30 Hour Pocket-watch) or a slower Train of about 16000, (the Train of the new Pendulum Pocket-watches) or any other Train.

Having chosen your Train, then resolve upon the Number of Turns you intend your Fusy shall have, and upon the Number of Hours you would have your Piece to go: As suppose 12 Turns, and to go 30 Hours, or 192 Hours (*i.e.* eight Days,) &c.

Then proceed to find out the Beats of the Balance or Pendulum in one Turn of the Fusy, by the Direction given under the Word Beat, thus in Numbers, 12 : 16 :: 20000 : 26666. Wherefore, 26666 are the Beats in one Turn of the Fusy or great Wheel, and are equal to the Quotients of all the Wheels unto the Balance multiplied together: But now this Number is to be broken

into a convenient Parcel of Quotients; which is to be done thus:

First, halve your Number of Beats, viz. 26666, and you'll have 13333; then pitch upon the Number of your Crown-wheel, as suppose 17. Divide 13333 by 17, and you'll have 784 for the Quotients (or Turns) of the rest of the Wheels and Pinions; which being too big for one or two Quotients, may be best broken into three; chuse therefore three Numbers, which when multiplied all together continually, will come nearest 784. As suppose 10, 9 and 9, multiplied continually, gives 810, which is somewhat too much; therefore try again other Numbers, 11, 9 and 8; these drawn one into another continually produce 792, which is as near as can be, and convenient Quotients.

Having thus contrived your Piece from the great Wheel to the Balance; but the Numbers not falling out exactly, according as you at first proposed, you must correct your Work thus:

First, (by the Direction given under the Word Beats) Multiply 792, (the Product of all the Quotients pitched upon) by 17, the Notches of the Crown-wheel, the Product is 13464, which is half the Number of Beats in one Turn of the Fusy; then (by a Rule given under the Word Beat) find the true Number of Beats in an Hour.

Thus, 16 : 12 :: 13464 : 10098, which is half the Beats in an Hour.

Then find what Quotient is to be laid upon the Pinion of Report (by the Rule given under that Word.)

Thus, 16 : 12 :: 12 : 9, the Quotient of the Pinion of Report.

Now having found your Quotients, 'tis easie to determine what Numbers your Pinions shall have; for chuse what Numbers your Wheels shall have, and multiply the Pinion by their Quotients, and that produceth the Number for your Wheels, as you see in the Margin.

4) 36 (9
5) 55 (11
5) 45 (9
5) 40 (8
17

Thus the Number of your Pinion of Report is 4, and its Quotient 9, therefore the Number for the Dial-wheel must be $4 \times 9 = 36$; so the next Pinion being 5, its Quotient 11, therefore the great Wheel must be $5 \times 11 = 55$, and so of the rest.

Thus you have the common and practical Method of Calculating the Numbers of a 16 Hour Watch.

And this Watch may be made to go a longer Time by lessening the Train, and altering the Pinion of Report.

As suppose you could conveniently slacken the Train to 16000, then by the Rule given under the Word Beat, say, As $\frac{1}{2}$ 16000, or 8000 : 13464 :: 12 : 20. So that this Watch will go 20 Hours.

Then for the Pinion of Report, say, (by the Rule given under that Word) As 20 : 12 :: 12 : 7. So that 7 is the Quotient of the Pinion of Report.

And as to the Numbers, the Operation is the same as before, only the Dial-wheel is but 28, for its Quotient is altered to 7.

But if you would give Numbers to a Watch of about 10000 Beats in an Hour, to have 12 Turns of the Fusy, to go 170 Hours, and 17 Notches in the Crown-wheel.

$$\begin{array}{r} 4) 28 (7 \\ 5) 55 (11 \\ 5) 45 (9 \\ 5) 48 (8 \end{array}$$

The Work is the same in a manner, as in the last Example, and consequently thus :

As 12 : 170 :: 10000 : 141666, which fourth Number are the Beats in one Turn of the Fusy ; Its half 70833 being divided by 17, gives 1467 for the Quotients. And because this Number is too big for three Quotients, therefore chuse four, as 10, 8, 6, whose Product into 17 maketh 71808, nearly equal to half the true Beats in one Turn of the Fusy.

Then say, as 170 : 12 :: 71808 : 5069, which is half the true Train of your Watch.

And say again, 170 : 12 :: 12 : $\frac{244}{17}$, (or 170) 144, which expresses the Pinion of Report, and the Number of the Dial-wheel.

But these Numbers being too big to be cut in small Wheels, therefore they must be varied by the fourth Rule of this, saying,

As 144 : 170 :: 360 : 425.
Or 170 : 144 :: 360 : 305.

Then dividing 360, and either of these two fourth Proportionals, (as directed by the Rule) suppose by 15, you'll have $\frac{24}{5}$ or $\frac{32}{5}$; then the Numbers of the whole Movement will stand thus :

24)	20	($\frac{24}{5}$)
6)	60	(10)
6)	48	(8)
5)	40	(8)
5)	33	($6\frac{2}{3}$)
	17	

Thus much may serve concerning the Calculation of ordinary Watches, to shew the Hour of the Day : But in such as shew Minutes and Seconds, the Process is thus :

First, having resolved upon your Beats in an Hour, then by dividing your designed Train by 60, find the Beats in a Minute ; and accordingly, find out such proper Numbers for your Crown-wheel and Quotients, as that the Minute-wheel shall go round once in an Hour, and the Second-wheel once a Minute.

As suppose you should chuse a Pendulum of six Inches to go 8 Days, with 16 Turns of the Fusy ; a Pendulum of 6 Inches (by Mr. Smith's Tables in *Horol. Diss.*) vibrates 9368 in an Hour ; and consequently, dividing it by 60, gives 156, the Beats in a Minute. Half these Sums are 4684 and 78. Now the first Work is to break this 78 into good Proportion ; which will fall into one Quotient, and the Crown-wheel. Let the Crown-wheel have 15 Notches ; then 78 divided by 15, gives 5 ; so

8) 40 (5
15

8) 64 (8
8) 60 (7
8) 40 (5

to shew Seconds. Next for a Hand to go round in an Hour, to shew Minutes. And because there are 60 Minutes in an Hour, 'tis but breaking 60 into good Quotients (as suppose 10 and 6, or 8 and 7, or &c.) and 'tis done.

Thus 4684 is broken, as near as can be, into proper Numbers.

But since it don't fall out exactly into the above-mentioned Numbers, you must correct (as you

were directed before) and find out the true Number of Beats in an Hour, by multiplying 15 by 5, which makes 75 ; and 75 by 60, makes 4500, which is the half of the true Train. Then find the Beats in one Turn of the Fusy, thus, 16 : 192 :: 4500 : 54000 ; which last are half the Beats in one Turn of the Fusy. This 54000 being divided by 4500, (which are the true Numbers already pitched upon) the Quotient will be 12, which being not too big for one single Quotient, needs not be divided into more, and the Work will stand thus :

As to the Hour-hand, the great
9) 108 (12 Wheel which performs only one
8) 64 (8 Révolution in 12 Turns of the Mi-
8) 60 (7 $\frac{1}{2}$ nute-wheel, will shew the Hour ;
8) 40 (5 or you may order it to be done by
15 the Minute-wheel.

For the Calculation of the Striking Part of any Clock, observe these Directions.

1. Consider that here you need have regard only to the *Count-wheel*, *Striking-wheel*, and *Detent-wheel*, which move round in this Proportion.

The *Count-wheel*, commonly goes round once in 12 or 24 Hours : The *Detent-wheel* moves round every Stroke the Clock striketh, or sometimes but once in two Strokes ; wherefore it follows, That,

2. As many Pins as are in the Pin-wheel, so many Turns hath the Detent-wheel in one Turn of the Pin-wheel ; or (which is the same) the Pins of the Pin-wheel, are the Quotient of that Wheel, divided by the Pinion of the Detent-wheel. But if the Detent-wheel moveth but once round in two Strokes of the Clock, then the said Quotient is but half the Number of Pins.

3. As many Turns of the Pin-wheel as are required to perform the Strokes of 12 Hours, (which are 78) so many Turns must the Pinion of Report have, to turn round the Count-wheel once : Or thus, the Quotient of 78 divided by the Number of Striking-pins, shall be the Quotient for the Pinion of Report, and the Count-wheel ; and this is in case the Pinion of Report be fixed to the Arbor of the Pin-wheel, as is commonly done. This Example will make all plain : The Locking-wheel being 48, the Pinion of Report 8, the Pin-wheel 78, the Striking-pins are 13, and so of the rest. Note also, That 78 divided by 13, gives 6, the Quotient of the Pinion of Report.

As for the *Warning-wheel* and *Flying-wheel*, it matters little what Number they have, their Use being only to bridle the Rapidity of the Motion of the other Wheels.

4. The following Rules will also be of great Use in this kind of Calculation ; and by their Help these Problems may readily be resolved.

1. To find how many Strokes the Clock striketh in one Turn of the Fusy or Barrel.

As the Number of Turns of the Great-wheel, or Fusy, is to the Days of the Clock's continuance : So is the Number of Strokes in 24 Hours, viz. 156, To

to the Strokes in one Turn of the Fusy or Great-wheel.

2. To find how many Days the Clock will go.

As the Number of Strokes in 24 Hours, viz. 156, Is to the Strokes in one Turn of the Fusy : : So is the Turns of the Fusy or Great-wheel, To the Days of the Clock's Continuance or Going.

3. To find the Number of Turns of the Fusy or Barrel.

As the Strokes in one Turn of the Fusy, Is to the Strokes in 24 Hours, viz. 156 : : So is the Clock's Continuance, To the Number of Turns of the Fusy or Great-wheel.

4. To fit the Pinion of Report on the Spindle of the Great-wheel.

As the Number of Strokes in the Clock's Continuance, or in all its Turns of the Fusy, to the Turns of the Fusy : : So are the Strokes in 12 Hours, which are 78, To the Quotient of the Pinion of Report, fixed upon the Arbor of the Great-wheel.

5. To fix the Pinion of Report to any Wheel.

Divide 78 by the Number of Strokes in one Turn of the Wheel you intend to fix your Pinion of Report upon, and your Quotient shall be that of the Pinion of Report.

6. To find the Strokes in the Clock's Continuance, viz.

As 12 : Is to 78 : : So are the Hours of the Clock's Continuance : To the Number of Strokes in that Time.

Or thus rather ; Multiply the Strokes in one Turn of the Great-wheel by the Number of Turns of the Fusy, the Product are the Strokes in the Clock's Continuance.

The Use of these Rules appears plain by the following Examples.

1. In small Pieces ; having pitched upon the Number of Turns, and the Continuance of your Clock, find (by Rule 6.) the Strokes in its Continuance ; then (if you make the Great-wheel the Pinion-wheel) divide these Strokes by the Number of Turns, and you have the Number of Striking-pins ; Or divide by the Number of Pins, and you have the Number of Turns.

Thus a Clock of 30 Hours, with 15 Turns of the Great-wheel, hath 195 Strokes.

For (by Rule 6.) $12 : 78 :: 30 : 195$.

Dividing by $\left\{ \begin{array}{l} 15 \\ 13 \end{array} \right\}$ 195 $\left\{ \begin{array}{l} 13 \\ 15 \end{array} \right\}$ the Striking-pin.
15, the Number of Turns.

2. In Calculating the Numbers of a Clock of much longer Continuance, you must make your Pin-wheel further distant from the Great-wheel : And having pitched upon your Turns, find out the Number of Strokes in one Turn of the Great-wheel or Fusy, (by Rule 1.) Thus in an 8 Day Piece of

16 Turns, As $16 : 8 :: 156 : 78$. Also, in a Piece of 32 Days and 16 Turns, $16 : 32 :: 156 : 312$.

These Strokes thus found, are the Number which is to be broken into a convenient Parcel of Quotients, thus :

First, resolve upon the Number of your Striking-pins, by which divide the last mentioned Number, the Quotient arising shall be one or more Quotients for the Wheels and Pinions. Thus in the Month-piece, if you take your Pins 8, divide 312 by it, the Quotient is 39 ; but that being too big for one must be cut into two Quotients for Wheels and Pinions, or as near as possible, which are either 7 and 5, or $6\frac{1}{2}$, and 6, which last is equal to 39, and therefore may stand, and 'twill be thus :

10) 65 ($6\frac{1}{2}$
8) 48 (6
6) 48 (8 Pins.

The Quotient being thus determined, and accordingly the Wheels and Pinions ; then find a Quotient for the Pinion of Report, to carry round the Count-wheel once in 12 Hours, or as you please. If you fix your Pinion of Report on the Great-wheel Arbor, you must work by the fourth Rule.

Thus in the last Example, the Strokes in the Continuance are 4992 (by Rule 6.) then (by Rule 4.) as $4992 : 16 :: 78 : \frac{4992}{16}$, or 4992) 1248, which is the Pinion and the Wheel.

But these Numbers being not the usual Numbers of a Month-piece, but only made use of here for Illustration sake ; and in Practice they commonly increase the Number of Strikings, and so make the Second-wheel the Striking-wheel. Suppose you take 24 Pins, divide 312 by it, and the Quotient is 13, which is little enough for one Quotient, and may therefore stand thus :

8) 104 (13
6) 72 (12, 24 Pins ;

Where the Quotient of the First-wheel is 13. In the Second-wheel of 72 Teeth, are the 24 Pins, altho' its Quotient is but 12, because the Hoop-wheel is double, and goes round but once in two Strokes of the Pin-wheel. In this the Pinion of Report is the same with the last, if fixed upon the Arbor of the Great-wheel. But if fixed on the Arbor of the Second or Pin-wheel, its Quotient is found by Rule 5, viz. 78 divided by 24, gives the Quotient of the Pinion of Report $3\frac{1}{2}$, thus 12) 39 ($3\frac{1}{2}$ The Pinion of Report being then 12, the Count-wheel will be 39.

The Calculation of a Year-piece is the same ; however, to perfect the Reader therein, we shall give this Example.

Suppose your Piece were to go 395 Days with 16 Turns, and 26 Striking-pins. There are 3851 Strokes in one Turn of the Great-wheel (by the Rule 1.) for $16 : 395 :: 156 : 3851$. And 3851 divided by 26, leaves 148 to be broken into Quotients, for Wheels and Pinions, which may be 12 and 12 ; for 12 into 12, gives 144, which is as near as it can well be to 148 ; then the Work stands thus :

10) 120 (12
8) 96 (12
78 (26 Pins.

In this Place, it would not be amiss for you to correct your Work, and see how near your Number comes to what you designed at first, because they did not fall out exact.

First, for the true Continuance of your Clock, Multiply the Quotients and Striking-pins together, and you'll have the true Number of Strokes in one Turn of the Great-wheel. So here, $12 \times 12 \times 26 = 3744$, which is the true Number of Strokes; then the true Continuance (by Rule 2) is 384, for

As 156 : 3744 :: 16 : 384

If this Continuance doth not please you, you may come nearer to your first proposed Number of 395 Days by a small Encrease of the Number of Turns, (by Rule 3) viz. making your Turns almost $16\frac{1}{2}$; for,

As 3744 : 156 :: 395 : $16\frac{1}{2}$ near.

But for the Pinion of Report, if you fix it on the Great-wheel, it will require an excessive Number; if you fix it upon the Pin-wheel, which is usual, then (by Rule 5) it will stand thus, 13) 39 (3 the Quotient is 3, the Pinion of Report 13, and the Count-wheel 39.

If to any Clock it be required to fit Quarters or Chimes, &c. you may proceed thus.

1. You are to consider, that Quarters are generally a distinct Part from the Clock-part, which striketh the Hour; and the Striking-wheel may be the First, Second-wheel, &c. according to your Clock's Continuance; unto which Wheel you may fix the Pinion of Report.

The Locking-wheel must be divided into 4, 8, or more unequal Parts, so as to strike the Quarter, and lock at the first Notch, or the Half Hour, and lock at the second Notch, &c. And in doing this you may make it to Chime the Quarters, or strike them upon two Bells, or more.

'Tis usual for the Pin-wheel or the Locking-wheel to unlock the Hour-part in these Clocks; which is easily done by some Jogg or Latch, at the End of the last Quarter, to lift up the Detents of the Hour-parts.

If you would have your Clock strike at the Half Hour, as well as whole Hour, you must make the Locking-wheel of the Hour-part double; that is, it must have two Notches of a sort, to strike 1, 2, 3, 4, &c. twice a-piece.

2. As for Chimes, I need say nothing of the Lifting-pieces and Detents, to lock and unlock; nor of the Wheels to bridle the Motion of the Barrel; only you are to observe, That the Barrel must be as long in turning round, as you are in Singing the Tune it is to Play.

As for the Chime-Barrel, it may be made up of certain Bars that run athwart it, with a convenient Number of Holes punched in them, to put in the Pins that are to draw each Hammer. By this means you may change the Tune, without changing the Barrel. Such is the Royal-Exchange Clock

in London, and others. In this Case, the Pins or Nut which draw the Hammers, must hang down from the Bar, some more, some less, and some standing upright in the Bar; the Reason whereof is, to play the Time of the Tune rightly.

For the Distance of each of these Bars may be a Semibrief, &c. of which hereafter.

But the usual way is, to have the Pins that draw the Hammers, fixed on the Barrel. For the placing of which Pins, you may proceed by the way of Changes on Bells, viz. 1, 2, 3, 4, &c. Or rather make use of the Musical Notes.

Where you must observe, what is the Compass of your Tune, or how many Notes or Bells there are from the highest to the lowest; and accordingly, the Barrel must be divided from End to End.

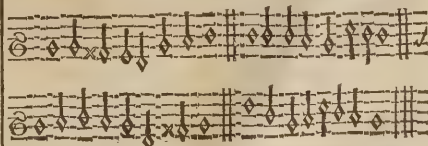
Thus, in the following Examples, each of those Tunes are 8 Notes in compass; and accordingly, the Barrel is divided into 8 Parts. These Divisions are struck round the Barrel, opposite to which are the Hammer-tails.

I speak here, as if there was only one Hammer to each Bell, that you may more clearly apprehend what I am explaining. But when two Notes of the same Sound come together in a Tune, there must be two Hammers to that Bell, to strike it. So that, if in all the Tunes you intend to Chime, of 8 Notes compass, there should happen to be such double Notes on every Bell, instead of 8 you must have 16 Hammers; and accordingly, you must divide your Barrel, and strike 16 Strokes round it, opposite to each Hammer-tail.

Then you are to divide it round about into as many Divisions, as there are Musical Bars, Semibriefs, Minums, &c. in your Tune.

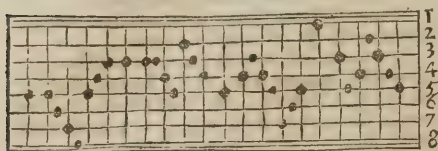
Thus the 100th Psalm-tune hath 20 Semibriefs; and each Division of it is a Semibrief. The first Note of it also is a Semibrief and therefore on the Chime-Barrel must be a whole Division from 5 to 5, as you may understand plainly, if you conceive the Surface of a Chime-Barrel to be represented by the following Tables, as if the Cylindrical Superficies of the Barrel were stretch'd out at length or extended on a Plain. And then such a Table so dotted or divided, if it were to be wrapped round the Barrel, would shew the Places where all the Pins are to stand in the Barrel: For the Dots running about the Table, are the Places of the Pins that play the Tune.

The Notes of the 100 Psalm.



A Table

*A Table for Dividing the Chime-Barrel of the
100 Psalm.*



If you would have your Chimes compleat indeed, you ought to have a Set of Bells to the Gamut Notes; so as that each Bell having the true Sound of *Sol, La, Mi, Fa*, you may play any Tune with its Flats and Sharps; nay, you may by these means play both the Bass and Treble, with one Barrel.

And by setting the Names of your Bells at the Head of any Tune, you may easily transfer that Tune to your Chime-Barrel, without any Skill in Musick. But observe, That each Line in the Musick is three Notes distant; that is, there is a Note between each Line, as well as upon it.

To Calculate a Piece of Clock-work that shall represent any of the Celestial Motions.

To effect which, you may either make those Motions to depend on the Work already in the Movement, or else you may measure them by the Beats of a Balance or Pendulum.

If you would proceed the latter way, you must however contrive a Piece to go a certain Time, with a certain Number of Turns.

But to determine the Motion intended, you must proceed one of these two ways; either,

1. Find how many Beats are in the Revolution; divide these Beats by the Beats in one Turn of the Wheel or Pinion, which you intend shall drive the intended Revolution, and the Quotient shall be the Number to perform the same; which, if it be too big for one, may be broken into more Quotients. Thus, if you would represent the Synodical Revolution of the Moon, (which is 29 Days, 12 $\frac{1}{2}$ Hours) with a Pendulum that swings Seconds, the Movement to go 8 Days, with 16 Turns of the Fusy, and the Great-wheel to drive the Revolution, divide 2551500 (the Beats in 29 Days, 12 $\frac{1}{2}$ Hours) by 4200, (the Beats in one Turn of the Great-wheel) and you'll have 59 in the Quotient; which being too big for one, may be put into two Quotients.

Or,

2. You may proceed as directed before in Calculating a Piece of Watch-work, *viz.* Chuse your Train, Turns of the Fusy, Continuance, &c. And then, instead of finding a Quotient for the Pinion of Report, find a Number, (which is all one as a Pinion of Report) to Specificate your Revolution by this Rule following.

As the Beats in one Turn of the Great-wheel is to the Train; So are the Hours of the Revolution to the Quotient of the Revolution.

Thus, to perform the Revolution of *Saturn*, (which in 29 Years, 183 Days) with a 16 Hour Watch, of 26928 Beats in one Turn of the Fusy, and 20196 the Train; the Quotient of the Revolution will be 193824. For as 26928 : 20196 :: 258432 : (the Hours in 22 Years and 183 Days) To 193824.

Here Note, That the Great-wheel Pinion is to drive the Revolution-work.

But if you would have the Revolution to be driven by the Dyal-wheel, and the Work already in the Movement, then you must first know the Days of the Revolution. And because the Dyal-wheel commonly goeth round twice in a Day, therefore double the Number of the Days in the Revolution, and you have the Number of Turns of the Dyal-wheel in that Time. This Number of Turns, is what you are to break into a convenient Number of Quotients, for the Wheels and Pinions.

1. *A Motion to shew the Day of the Month.*

The Days in the largest Month are 31; those doubled are 62, which are the Turns of the Dyal-wheel, which may be broken into these two Quotients 15 $\frac{1}{2}$ and 4, whose Product is 62; therefore chusing your Wheels and Pinions (by the former Directions) your Work is done, and will stand thus:

$$\begin{array}{r} 4) 62 \text{ (} 15 \frac{1}{2} \\ 5) 20 \text{ (} 4 \end{array}$$

Or if a larger Pinion than one of 5 be necessary, by reason it is concentrick to a Wheel, you may take 10 for the Pinion, and 40 for the Wheel; then 'twill stand thus:

$$\begin{array}{r} 4) 62 \text{ (} 15 \\ 10) 40 \text{ (} 4 \end{array}$$

And the Work will lie thus in the Movement, *viz.* Fix your Pinion 10 concentrick to the Dyal-wheel (or to turn round with it upon the same Spindle) This Pinion 10 drives the Wheel 40; which Wheel has the Pinion 4 in its Center, which carrieth about a Ring of 62 Teeth, divided on the upper Side into 31 Parts or Days.

Or, without the Trouble of many Wheels you may effect this Motion, *viz.* By a Ring divided into 30 or 31 Days, and as many Fangs or Teeth, which are caught and pushed forward once in 24 Hours by a Pin in the Wheel, that goeth round in that Time. This is the usual way in Royal Pendulums, and many other Watches; and therefore being common, there needs no more be said of it.

2. *A Motion to shew the Age of the Moon.*

The Moon finisheth her Course in 29 Days and a little above an half. This 29 $\frac{1}{2}$ Days, (not regarding the small Excess) makes 59 twelve Hours or Turns of the Dyal-wheel, which is to be broken into convenient Quotients; which may be 5, 9, and 10, as here,

$$\begin{array}{r} 10 \div 59 \text{ (59 4) } 59 \text{ (14 } \frac{1}{4} \\ 4 \div 40 \text{ (10 10) } 40 \text{ (4} \end{array}$$

Or $14 \frac{1}{4}$ and 4; so that if you fix a Pinion of 10 concentricall. with your Dial-wheel, to drive a Wheel of 40, which drives a Pinion of 4, which carries about a Ring, or Wheel of 59 Teeth once in $29 \frac{1}{2}$ Days; which Ring may be also be divided into $29 \frac{1}{2}$ Parts; or carry an Index to point to a Circle so divided.

3: A Motion to shew the Day of the Year, the Sun's Place in the Ecliptick, Sun's Rising or Setting, or any other Annual Motion of 365 Days.

The Double of 365, is 730, the Turns of the Dial-wheel in one Year; which may be broken into these Quotients, viz. $18 \frac{1}{4}$ and 10 and 4, thus.

$$\begin{array}{r} 4 \div 73 \text{ (18 } \frac{1}{4} \\ 4 \div 40 \text{ (10} \\ 5 \div 20 \text{ (4} \end{array}$$

Or into $18 \frac{1}{4}$, 8 and 5, thus,

$$\begin{array}{r} 4 \div 73 \text{ (18 } \frac{1}{4} \\ 4 \div 32 \text{ (8} \\ 4 \div 20 \text{ (5} \end{array}$$

So that a Pinion of 5 is to lead a Wheel of 20, which again, by a Pinion of 40; and that by a Pinion of 4, carrieth about a Wheel or Ring of 73 divided into 12 Months, and their Days; or into the 12 Signs; and their Degrees, or into the Sun's Rising and Setting, &c. And for the setting on of this last, Mr. Oughbred has given a Table in his *Opuscula*.

4. To shew the Tides at any Port.

This is done without any other trouble, than the Moon's Ring (mentioned in the 2 of this) to move round by a fixed Circle, divided into twice 12 Hours, and numbred the contrary way to the Age of the Moon.

To set this to go right, you must find out at what Point of the Compass the Moon makes Full Sea, at the Place you would have your Watch serve to: Convert that Point into Hours, allowing for every Point North or South lost, 45 of an Hour.

Thus at *London-Bridge*, 'tis vulgarly thought to be High-water the Moon at North-East, and South-West, which are four Points from the North or South.

Or thus: By the Tide-Tables, learn how many Hours from the Moon's Southing, 'tis High-water.

Or thus: Find at what Hour it is High-water, at the Full and Change of the Moon; as at *London-Bridge*, the full Tide is reckoned to be three Hours from the Moon's Southing, or at 3 of the Clock at the Full and Change. The Day of Conjunction, or New-Moon, with a little Stud to point, being set to the Hour so found, will afterwards point to the Hour of the full Tide.

This is the common way: But this Ring being always in Motion, whereas the Tides are not, a better way perhaps may be found out; as suppose by causing a Wheel or Ring to be moved forward

only twice a Day, and to keep Time (as near as can be) with the Accurate Mr. Flamsteed's most correct Tables.

5. To calculate Numbers, to shew the Motion of the Planets, the slow Motion of the fixed Stars, the Sun's Apogæum, the Revolution of the Dragon's Head and Tail, whereby the Eclipses of the Sun and Moon are found, the Revolution of the several Orbs, according to the Ptolemaick System, or of the Celestial Bodies themselves, according to better Systems, &c.

Besides the Direction already given, there needs only thus much in general, i. e. Knowing the Years of any of these Revolutions, you may break that Number into Quotients, if you will make the Revolution depend upon the Year's Motion which is already in the Movement, and described in the 3d of this. Or if you would have it depend upon the Dial-wheel, or upon the Beats of a Pendulum, enough is said before to direct you in this Matter.

In all these slow Motions, you may somewhat shorten your Labour by endless Screws to serve for Pinions, which are but as a Pinion of one Tooth.

An Instance of this you have in the Account Sir Jonas Moore gives of his large Sphere-going Clock-work, in his *Math. Compendium*, p. 117. where a Motion of 17100 Years is performed by fix Wheels, being for the Sun's Apogæum. His Words are these.

"For the Great-wheel fixed is 96, a Spindle-wheel of 12 Bars turns round it 8 times in 24 Hours; that is, in 3 Hours; after these, there are four Wheels, 20, 73, 24, 75, wrought by endless Screws, that are in Value but one; wherefore 3, 20, 73, 24, and 75, multiplied together continually produceth 7884000 Hours, which divided by 24, gives 3285000 Days, equal to 900 Years. Now on the last Wheel, 75 is a Pinion of 6, turning a great Wheel that carrieth the Apogæum Number 114; and 114 divided by 6, gives 19 the Quotient; and 900 Times 19, is 17100 Years.

WATER, which the Chymists call *Pblegm*, is the 4th of the 5 Chymical Principles, and one of the Passive ones. 'Tis never drawn pure and unmix'd, which makes it a little more detestful than common Water.

This Principle, probably, contributes much to the Growth of Bodies, in that it both renders and keeps the Active Principles fluid. So that they are capable of being convey'd by Circulation into the Pores of the Mix'd; and also, because it tempers their exorbitant Motion, and keeps them together, so that they are not so easily and soon diffipated.

In all such Bodies, whose Active Substances are joined and united pretty closely together, as in common Salt, Tarter, all Plants that are not odoriferous, and in many Animal Bodies this Principle is the first that comes in Distillation. But when Water is mixed with volatile Salts, or with the Spirit of Wine, or is in any odoriferous Mixt, then the volatile Particles will rise and come away first.

WATER-Born, is when a Ship even and just with the Ground, first begins to float or swim, being born up by the Water.

WATER-Line of a Ship, is that which distinguisheth that Part of her which is under Water from that above, when she is duly laden.

WATER-Shot, is a fort of Riding at Anchor, when a Ship is *Moored* neither croses the Tide nor right up and down, but quartered betwixt both.

WATER-Way, in a Ship, is a small Piece of Timber lying fore and aft on her Deck, close by her Sides, to prevent the Waters running down there.

WATERY Humour of the Eye : See *Aqueous Humours*.

WATERY Meteors : See *Meteors*.

WAVED, or *Wavy*, a Term in Heraldry, when a Bordure, or any *Ordinary* or *Charge* in a Coat of Arms hath its Out-lines of this Shape



easily rising and falling like the Waves of the Sea.

WAVES of the Sea, or any Water. Sir Isaac Newton hath demonstrated, *Lib. 2. Prop. 45. Princip.* That their Velocity is always in half the Ratio of their Breadth; and their Breadth is estimated to be the Distance between the two Summits, or top Edges of any two Waves; or a right Line drawn from the middle of one Hollow, to the middle of the other.

Let there be a Pendulum, whose Length from the Point of Suspension to the Center of Oscillation shall be the Breadth of any two Waves; then while the Pendulum makes its Oscillations, the Waves will pass over a Distance equal to their Breadth.

Hence he concludes, That those Waves whose Latitude or Breadth is $3\frac{1}{3}$ Parisian Feet, will pass over a Distance equal to their Breadth in a Second of Time.

And in the Time of one Minute, these Waves will run $183\frac{1}{2}$ Feet, and in the Space of an Hour, 11000 such Feet nearly.

WAY of a Ship, is sometimes the same with the *Rake* or *Run* of her forward or aftward on: But 'tis mostly used as to her Sailing: For when she goes a-pace, they say, *She hath a good Way*, or makes a fresh Way. Also when they keep an Account how fast the sails by the Log; they call it *keeping an Account of her Way*: And because most Ships are apt to fall a little to Leeward of their true Course, they always in casting up the Log-board, allow something for her *Leeward Way*, or *Lee-way*; which is one Point or more according to her Way of Sailing.

WAY of the Rounds in Fortification, is a Space left for the Passage of the Rounds between the Rampart and the Wall of a Fortify'd Town. But it is not so much in use, because not having a Parapet above a Foot thick, it may be soon overthrown by the Enemies Cannon.

WAYWISER, the same with *Perambulator*; which see.

WEAPON-SALVE : See *Armarium*.

WEATHER-COYLE; when a Ship being a Hull, has her Head brought about, so as to lie that way which her Stern did before, without loosing of

any Sail, but only by the bearing up of the Helm, this is called *Weather-coying* of her.

WEATHER-GAGE, that Ship is said to have the *Weather-gage* of another, when she is to Windward of her.

WEIGHT of the Air : See *Air*. Mr. Boyle calculates, That when the Mercury in the common Barometer, stands at 30 Inches, the Weight of the whole Atmospheric Column of Air, incumbent on an Inch Square of Space, is 18 Pounds $\frac{1}{2}$ Troy, or 15 Pounds $\frac{2}{7}$ Averdupois.

WEIGHT of a Cubick-Inch of several Bodies.

Mr. Boyle found that the Weight of a Cubick-Inch.

Of Water was 256 Grains.
Of Quicksilver 3580 Grains.

	Weight.	Magni- tude.	Weight in Water.
	Oz.		
Gold.	9.91735	0.10083	9.33962
Quicksilver.	7.93388	0.12604	7.35615
Lead.	6.16198	0.16229	5.58425
Silver.	5.50083	0.18179	4.92310
Copper.	4.81342	0.20776	4.23569
Hammered Iron.	4.27715	0.23380	3.69942
Cast Iron.	3.96321	0.25258	3.29048
Tin.	3.96694	0.25208	3.38921
Marble.	1.59631	0.62644	1.01858
Common Stones.	1.09835	0.91045	0.52062
Honey.	0.79339	1.26042	0.21566
Salt Water.	0.57773	1.79490	
Fresh Water.	0.52773	1.77490	
Oil.	0.47603	2.10069	
Wheat.	0.37628	2.65757	
Dried Oak.	0.40745	2.45609	

The Weight of Bodies on the Surface of the Planets.

Suppose in the Sun	} 10000 {	that same Body on the
it weigh		
Earth mult weigh		
Jupiter,		
Of { Moon,		
Saturn,	90536	

Weight of a Cubick Foot of several Bodies.

	Averdupois Weight.	lb.	3.
Wheat of the best sort,	48	8	0
White Oats,	29	8	0
White Pease,	50	8	0
Barley,	41	2	0
Malt two Months old,	30	4	0
Field Beans,	50	8	0
Wheaten-meal unsifted,	31	0	0
Rye-meal unsifted,	28	0	0
Pump-water,	62	8	0
Bay-salt,	54	1	0
White Sea-salt,	43	12	0
Common Sand,	85	4	0
Newcastle Coal,	67	12	0
Gravel,	109	5	0
Wood-ashes,	58	5	0

Our Excellent Sir Isaac Newton saith, he found by most accurate Experiments on Pendulums, that

the Quantity of Matter in Bodies, is always proportionable to their *Weight*.

He saith also, That the *Attractiones Motrices*, or Weights of one Sphere, or Globe, to another at equal Distances from the Centers, are as the attracting and attracted Sphere multiplied into one another; or as the Product of those two Spheres. But at unequal Distances from the Centers, as those Products divided by the Squares of the Distances between the Centers, *Prop. 76. Corol. Lib. I.*

A Table of the Foreign Pound Averdupois, compared with our Pound English.

The Pound Averdupois into 100 Parts.

London,	100
Paris,	0.93
Lyon,	1.09
Bologn,	0.89
Amsterdam,	0.93
Antwerp,	0.98
Leyden,	0.96
Lorain,	0.98
Mechlin,	0.98
Middlebourg,	0.93
Strasbourg,	0.94
Bremen,	0.97
Cologne,	0.93
Frankfort,	0.93
Hamborough,	0.95
Leipsick,	1.15
Norimberg,	0.94
Vienna,	0.83
Castile,	0.99
Lisbon,	1.06
Gibraltar,	1.03
Toledo,	1.00
Rome,	1.23
Bononia,	1.27
Florence,	1.23
Naples,	1.43
Genoa,	1.42
Mantua,	1.43
Milan,	1.40
Parma,	1.43
Venice,	1.53
Danzick,	1.19
Copenhagen,	0.94
Prague,	1.06
Cairo,	1.61
Constantinople,	0.86

Averdupois Weight, is that by which all Physical Drugs, Grocery, Rosin, Wax, Pitch, Tar, Tallow, Soap, Hemp, and all things that have Waste; all base Metals and Minerals, as Iron, Steel, Lead, Tin, Copper, Alom, Coperas, &c. are weighed.

A Table of Averdupois Weight.

Scruples.					
3	Drachms.				
24	8	Ounces.			
384	128	16	Pounds.		
43008	14336	1792	112	Hundred.	
860160	286720	35840	2240	20	Tuns.

Troy Weight, is that by which Gold, Silver, Jewels, Amber, Electuaries, Bread, Corn, Liquors, &c. are weighed; and from this Weight all Measures of wet and dry Commodities are taken.

A Table of Troy Weight.

Grains.			
24	Penny-weight.		
480	20	Ounces.	
5760	240	12	Pounds.

A Table of Apothecaries Weight.

Grains.			
20	Scruples.		
60	3	Drachms.	
480	24	8	Ounces.
5700	288	96	12 Pounds.

Foreign Weights.

Generally three sorts of *Weights* are used for Merchandize.

1. Weights of great Content; as Hundreds, Kintals, Centeners, Talents, Thousands, Weights, Skippounds, Charges, Lifpounds, Rooves, &c.

2. Weights of lesser Content; as Pounds, Mina's, Manchs' Rotuli, &c.

3. Small Weights as Ounces of 12, 14, 16, 18, 20, 30, &c. to the Pound, and the Subdivisions of the Ounce.

Talents of the Hebrews, Greeks, are seen before.

Cantars, Centeners, or Kintals, sometimes wrote Quintals, accounted by Merchants as Hundreds; are of 100, 112, 120, 125, 128, 132, and 140 Pounds.

Weights, or Weys, are commonly 165 Pound, or 180 Pound, or 200 Pound and $\frac{1}{2}$ for a Charge: Skippounds, used in many Places, *quasi* Skippound, or Skippound; for as in Italy, and other Countries, the *Carga*, *Cargo*, or *Charge*, is the Loading of an

Horse of 300 or 400 Pound: So is the Skippound taken for the Dividend of a Last of Corn laden in a Ship. Skippounds are of 300, 320, 340, and 400 Pound to the Skippound. Cargo is often taken for the whole Lading or Burthen of a Ship. Lifpounds, of 15, 16, and sometimes 20 Pound to the Lifpound.

Rooves, or Arrobas of 10, 20, 25, 30, and 40 Pound to the Roove.

Stone of 6, 8, 14, 16, 18, 20, 21, 24, 32, and 40 Pound to some Stones.

Poade of *Russia*, by *Heylin* is 40 Pound.

Mixias, is commonly understood to be 10000 Drachms, of 8 to an Ounce, and 12 Ounces to a Pound.

Seffertia's of *Cleopatra* in *Egypt*, and other Places in *Africa*, were two Pounds $\frac{1}{2}$, for 50 Seffertia's make 125 Pound, but in *Tbracia* it was but $2\frac{1}{2}$ of a Pound.

Pound is divided into more or less Ounces.

Mark Weight, commonly 8 Ounces.

Mark Pound 16 Ounces, that is 2 Marks.

Mina Ptolemaica, $1\frac{1}{2}$ *Rotuli*, or 18 Ounces, or 144 Drachms, and in lesser Divisions thus:

	<i>Rotuli.</i>	Ounces.	Drachms.	Scruples.	Oboli.	Lupines.	<i>Siliqua's</i> , or <i>Carrats.</i>	<i>Aereoli.</i>
<i>Mina.</i>	$1\frac{1}{2}$	18	144	432	864	1296	2592	6912
	<i>Rotulus.</i>	12	96	288	576	864	1728	4608
		Ounce.	8	24	48	72	144	384
			Drachm.	3	6	9	18	48
				Scruple.	2	3	6	16
					Obolus.	$1\frac{1}{2}$	3	8
						Lupine.	2	$5\frac{1}{2}$
							<i>Siliqua</i> , or <i>Carrat.</i>	$2\frac{1}{2}$

Mane, or Maneh, in *Arabia*, double one of 16 Ounces, and one of 20 Ounces.

That called *Alialica*, *Basaria*, *Alanthalica*, and *Egyptia*.

This *Romana*, and is indeed of *Alexandria*, the Pound there being 20 Ounces.

Rotulus in *Arabia*, *Syria*, *Asia Minor*, *Egypt*, and *Venice*, reckoned for a Pound, is thus divided,

	<i>Sachoff</i> , or Ounces.	<i>Sextaries</i> , or Cicles.	<i>Deniers</i> , or Aureos.	<i>Darching</i> , or Drachms.	<i>Scruples</i> , or Garma.	<i>Obolos</i> , or Orloffs.	<i>Danings</i> , or Lupines.	<i>Kirats</i> , or <i>Siliqua's</i> .	<i>Aereolas</i> , or <i>Keßuffs</i> .
<i>Rotulus</i> , or Pound.	12	24	84	96	288	576	864	1728	3456
	<i>Sachos</i> , <i>Sachos</i> , or Ounce,	2	7	8	24	48	72	144	288
		<i>Sextary</i> , or Cicle.	$3\frac{1}{2}$	4	12	24	36	72	144
			<i>Denier</i> , or Aureus,	$1\frac{1}{2}$	$3\frac{1}{2}$	$6\frac{6}{7}$	$10\frac{2}{7}$	$20\frac{4}{7}$	$41\frac{1}{7}$
			<i>Drachm</i> , or Aunius,	3	6	9	18	36	
			<i>Darch</i> , or Aundana-	Scruple,	2	3	6	12	
			<i>ing Alky</i> , or Oliginat,	Obolus,	$1\frac{1}{2}$	3	6		
				Kenmer.	Orloff,	or Daning,	2	4	
					Onoleffat,	or Onolum,	Danic	Carrat,	2
						Lupine,	Kirat,	or <i>Siliqua</i> .	

Some mention the Phyſick Pound at *Venice* to have but 7 Drachms in the Ounce.

The Lupines at *Venice*, called *Sextula's*, becauſe 1 Ounce hath 72, which is 6 times 12.

Every Keſtuff, or Aereolum (or Areolum) is the Weight of 2 Barly-Corns, ſo is there in the Rotulus 6912 Grains.

The *Alexandrian* Pound 20 Ounces, the Ounce 8 Scruples.

The *Italian* Pound generally is divided into 12 Ounces, 1 Ounce into 2 Staters, and 1 Stater into 4 Drachms; ſo hath 1 Pound 24 Staters, 96 Drachms.

But in Phyſick, there and in other Places, thus.

	Ounces.	Loots.	Sizaynes, or Siliquas.	Drams.	Scruples.	Obolos.	Siliqua's.	Grains.
Pound.	12	24	48	96	288	576	1728	5760
Ounce.	2	4	8	24	48	144	480	
		Loot.	2	4	12	24	72	240
			Sizayne, or Siliqua.	2	6	12	36	120
				Dram.	3	6	18	60
					Scruple.	2	6	20
						Obolus.	3	10
							Siliqua.	3 $\frac{1}{2}$

Spain, ſome ſay, hath a *Mina Romana*, which contains 20 Ounces: A common Pound of 16 Ounces, and a Phyſick Pound of 12 Ounces, each Ounce divided into 8 Drachms. The Ounce of the *Toletan* Phyſick Pound excepted, which hath, as ſome affirm, 9 Scruples.

	Libra.	$\frac{3}{4}$.	Duels.	Quar- terns.	Sixths.	$\frac{3}{8}$.	Syrian Beans.	$\frac{3}{16}$.	Obolos.	Carats.	Chalcos.	Grains.
<i>Mina Ro- mana.</i>	$1 \frac{1}{4}$	20	60	80	120	160	240	480	960	2880	5700	11520
	Libra.	12	36	48	72	96	144	288	576	1728	3456	6912
		$\frac{3}{4}$.	3	4	6	8	12	24	48	144	288	576
		Duel.		$1 \frac{1}{4}$	2	$2 \frac{1}{2}$	4	8	16	48	96	192
				Quar- tern.	$1 \frac{1}{2}$	2	3	6	12	36	72	144
					Sixth.	$1 \frac{1}{3}$	2	4	8	24	48	96
						$\frac{3}{4}$.	$1 \frac{1}{2}$	3	6	18	36	72
							Syrian Bean.	2	4	12	24	48
								$\frac{3}{16}$.	2	6	12	24
									Obolus.	3	6	12
										Carat.	2	4
											Chalcus.	2

The Common Pound of Spain.

	Mark.	Ounces.	Drams.	Adarmes, or Adarams.
Pound.	2	16	218	256
	Mark.	8	64	128
		Ounce.	8	16
			Dram.	2

The Physick Pound of Toledo.

	Ounces.	Drams.	Scruples.	Grains.
Pound.	12	108	324	6480
	Ounce.	9	27	540
		Dram.	3	60
			Scruple.	20

Pound Weights of France.

The Weight us'd by the Merchants for the most part, is of 16 Ounces, called *Livre d' Anvers*, tho' in some Places but 14, others 18 Ounces. *Cotgrave* writes the *Liure*, or *Bund de Lyon*, to be 15 Ounces, that *de Spaigne* but 14 Ounces, and divides the Pound of 16 Ounces, into 30 Halfs, 64 Sezaines, 128 Treseaux, 256 Gros, 512 Demi-gros. And the Pound us'd by the *Farriers*, consisting of 12 Ounces into 90 Drams, 270 Scruples, 540 Obols.

After *Malines*, the Ordinary, or Pound commonly us'd for Merchants, is parted thus.

The Pound Weight of Paris.

	Ounces.	Gros.	Scruple.	Grains.
Pound.	16	128	384	9216
	Ounce.	8	24	576
		Gros.	3	72
			Scruple.	24

The Physick Pound of Lyons.

	Ounces.	Drams.	Scruples.	Grains.
Pound.	12	96	288	5760
	Ounce.	8	24	480
		Dram.	3	60
			Scruple.	20

Cotgrave mentions a Weight called *Sentule* of 4 Scruples, or the sixth Part of 1 Ounce.

Pound Weights of Germany.

The Pound Weight of Vienna in Austria.

	Ounces.	Loos.	Quints.	Penins.	Grains.
Pound.	16	32	128	512	
	Ounce.	2	8	32	
			4	16	
				4	
					25

The German Physick Pound, by Alsted.

	Ounces.	Drams.	Scruples.	Grains.
Pound.	12	96	288	5760
	Ounce.	8	24	480
		Dram.	3	60
			Scruple.	20

In the Low-Countries they use Pounds of 12, 14, 15, &c. Ounces.

At *Bruges* in *Flanders*, they have 1 Pound of 14 Ounces, and 1 Pound of 16 Ounces; the 100 Pound of 16 Ounces makes 108 Pound of 14 Ounces; but the Ounces of 14 to the Pound are the heaviest, for 100 of these are 105 $\frac{1}{2}$ Ounces of 6 to the Pound; this Pound is thus divided.

	Ounces.	Loats.	Sizaines.	Drams.
Pound.	16	32	64	128
Ounce.		2	4	8
		Loat.	2	4
		Sizaine.		2

Drachm or Quint.

At *Antwerp* they use to weigh by the Hundred Pounds even Weight, called *Sutle*, for which commonly at the Weigh-house, is allow'd 101 Pound. A Stone is 8 Pound. The Skippond 300 Pound. The Weigh 165 Pound. The Carga, or Charge, 400 Pound, which is two Bales of 203 Pound each, for an Horse to carry. The Pound there is 16 Ounces.

This 100 Pound of Anwerp, weigheth in the Places following.

- 1 3 *Abbeville*, 94 $\frac{3}{4}$ lb.
- 2 11 *Achri*, 17 $\frac{1}{4}$ Rotuli. The 100, a Cantar Tambaran.
 - 138 Ordinary Weight.
 - Alder, { 91 To weigh Steel, Tin, and Copper.
- 1 8 *Ailoft*, 108 lb.
- 3 1 *Alcario*, { 164 lb.
 - 78 Minas of 16 Oz. to the Mina.
 - 27 Rotuli, of 6 lb. to the Rotuli.
 - 1 Pefa is 1 $\frac{1}{2}$ Metallicum, or a Drachm.
 - 50 Metallici 1 Mark. Our Mark 42 Metallici.
- Musk and Amber sold by this Weight in *Egypt*.
- 2 11 *Allepo*, 22 Rotuli, of 100 to a Cantar.
 - 1 Rotulus is 60 Oz. or 480 Metecalos, or Drachms.
 - 1 Oz. is 8 Metecalos, or Drachms.
 - 1 Drachm, or Metecalo, is $\frac{1}{8}$ Pefa.
 - 10 Pefa's are 1 Onga, or Ongia, to weigh Civer.
- 2 1 *Alexandria*, { 108 Rotuli, of 190 to a Cantar.
 - 78 Mina's of 20 Oz.
- America Malica*, { 90 lb. of 12 Oz. to the lb.
 - 36 Mina's Sestertias of 30 Oz.
- 2 11 *Aman*, as *Aleppo*.
- 1 8 *Amsterdam*, 94 $\frac{3}{4}$ lb. And for Silks they use the Weight of *Antwerp*.
- 1 7 *Aquila*, 147 lb.
- 1 3 *Aquismort*, 102 lb.
 - 78 Rotuli.
 - 104 Maires, or Minas.
- 2 2 *Arabia*, { 148 Pound.
 - 936 Ounces, or Sachosi, 12 to 1 Rotulus.
- 3 1 *Arcadia*, 92 lb. and 83 lb. for *Mavigetto*.
- 1 5 *Archipelago*, 120 lb.
 - 105 lb. of Oz. to the lb.
- Armoria bona*, { 93 lb. of 18 Oz. used for Silk and Copper.
 - 54 lb. of 32 Oz. Fleth Weight.
- 2 3 *Armenia*, 130 lb.

- 1 14 *Arragon*, { 106 lb.
 - 96 lb. Great Weight for Wooll.
- 1 8 *Arshot*, 100 lb. all one with *Antwerp*.
- 1 8 *Audenarde*, or *Oudenard*, 110 lb.
- 1 3 *Avignon*, 111 lb. a Centener is two Frailes of 56 lb.
- 1 4 *Ausburgh*, 95 lb.
- 1 8 *Bergen Op Zome*, 98 lb.
- 1 14 *Barcellona*, { 96 lb. Wooll Weight.
 - 106 lb. Common Weight.
 - 131 lb. Saffron Weight.
- 1 4 *Basil*, 96 lb. They use Centeners of 100 lb. 120 lb. and 132 lb.
- 1 7 *Bergamo*, 137 lb. and 108 lb. by the two Quintals.
- 1 1 *Bergen*, 96 lb. but uncertain weighing with a Sling.
- 1 4 *Bibrach*, 92 lb. of 16 Oz. to 1 lb. as *Constance*.
- 2 11 *Barutti*, 21 Rotuli.
- 1 7 *Bologna*, 53 lb. of 30 Oz. to weigh Wax and Wooll by Rooves of 1 lb.
- 1 4 *Boigoigne*, as *Abbeville*.
- 1 4 *Botsen*, { 128 lb. Ordinary Weight.
 - 91 lb. To weigh Steel, Tin, and Copper.
- 1 3 *Bourdeaux*, as *Abbeville*.
 - 120 lb. by the Centerer of 24 lb. to one Stone, and five Stone to one Centener, and 5 $\frac{1}{2}$ Stone to the Centener of 132 lb. there also used.
- 1 7 *Brescia*, 184 lb. and for *Venice Gold* 136 lb. 100 lb.
 - 93 lb. for Butter and Cheese, the Stone 6 lb. and 20 Stone one Weigh; but Wooll Weight is 108 lb. weighed by Stones of 6 lb. called Nails, or Neils, 18 Neils to the Hundred, 45 Neils to the Weigh, 2 Weighs to one Pocket of Wooll. *Hunt* says, 18 Neils is 144 lb. of our Wooll Weight.
- 1 8 *Brussels*, as *Arshot*.
 - Bucca, 44 Ocha's.
- 1 14 *Burgos*, 93 Rotuli.
- 2 1 *Bursa*, 88 Rotuli.
- 3 4 *Cabo Verde*, 107 $\frac{1}{2}$ lb. or Rotuli, a Quintal is 121 of 4 Rooves of 32 lb.
- 1 7 *Calabria*, 147 lb.
- 1 3 *Calais*, { 111 lb. Ordinary Weight.
 - 92 lb. Merchants Weight.
 - 114 lb. English Wooll Weight.
- 2 6 *Calicut*, 80 Aracoles. *Malines*, p. 18, mentioning the Baccar, or Bahar at *Calicut*, to be at *Lisbon* 4 great Quintals of 112 lb. to the Quintal, and that 4 Quintals are 480 Aracoles, that is 120 Aracoles for 1 Quintal. And again, that the Bahar is 20 Faracoles, which is 5 Quintals at *Lisbon* of 32 lb. per Roove; which is not well to be understood, seeing the great Quintal at *Lisbon* is 128 lb. or 4 Rooves of 32 lb. per Roove: Whereas 4 Quintals of 112 lb. is but 448 lb. and 5 Quintals of 728 lb. is 640 lb. unless there be two sorts of Bahars at *Calicut*, one of 48 Aracoles, and

and another of 20 Paracoles. Or that the Bahar be 5 great Quintals at 129 lb. the Quintal; that is 645 lb. for so many Pounds, or Portuguese Rotuly, are in in 480 Aracoles, for 100 lb. of Antwerp, which answer to 107 $\frac{1}{2}$ lb. of Portugal Weight by his own Concession in the same Page a little before.

- 3 3 Canary-Islands, 107 lb. as Sevil.
 1 5 Candia, { 138 lb. for Gold-Thread.
 { 89 Rotuli, whereof a 100. is a Cantar, or Quintal.
 1 7 Carpi, as Aquila.
 1 14 Castile, 102 lb.
 Cataio, 87 Rotuli 100 to a Cantar.
 1 7 Censena, as Bergamo.
 1 4 Collen, 93 $\frac{1}{2}$ lb.
 1 7 Como, as Aquila.
 1 9 Coninsberg, 125 lb. which is a Centener.
 A Last of Wheat there 5200 lb. a Stone 40 lb. a Skippound 10 Stone, that is 400 lb.
 1 4 Constance, 92 lb. of 16 Ounces, or 32 Loos: Some by the Centener of 100 lb. and some of 120 lb.
 1 5 Constan. 87 $\frac{1}{2}$ Rotuli, 100 to a Cantar.
 cinople, 139 Ochoa, Hunt writes it Cobaa.
 1 1 Copenhagen, 2 $\frac{1}{2}$ Metallici, which is their Drachm, makes 3 of ours.
 1 1 Copenhagen, 96 lb. There the Centener is 112 lb. A Stone is 10 lb. A Skippound 32 Stone, or 26 Lippound of 16 Mark Pound, which is a Skippound, or 320 lb.
 1 5 Corfu, { 97 lb. Great Weight.
 { 115 lb. Small Weight.
 1 8 Cortrycke, as Audenarde.
 1 3 Cracow, 124 lb. The Centener there is 136 lb.
 1 7 Crema, as Aquila.
 { 143 lb. of 12 Oz. most used.
 1 7 Cremona, { 132 lb. of 12 Oz. being 13 Oz. of the other.
 { 60 lb. of 28 Oz. to the lb. used for Fleth.
 2 1 Cyprus, 20 $\frac{1}{2}$ Rotuli 100 to the Cantar.
 2 11 Damascus, 26 Rotuli. There 1 Cantar is 5 Zurli, or Stone; and 1 Stone 20 Rotuli; 1 Rivola is 225 lb. Antwerp.
 1 9 Dantzick, 120 lb. There one Last of Wheat 4528 lb. The Last of Rye 4245 lb. 1 Skippound 340 lb. of 10 great Stone, 1 Skippound 320 lb. of 20 Lippound. 1 Centener 125 lb. 1 Stone for Spices 24 lb. 1 Great Stone for Grois-Wares 34 lb. 1 Lippound 16 Mark Pound.
 1 3 Diepe, as Abbeville.
 1 8 Dixmude, as Ailost.
 1 8 Doway, as Audenarde.
 1 6 Dublin, { 91 $\frac{1}{2}$ lb. by the Great Hundred.
 and in Ireland generally. { 104 lb. Suble Weight.
 1 12 Edinbur. { 96 lb. and 103 lb. $\frac{1}{2}$ for 112 lb. and all Scotl.
 1 4 Erfurd, 85 lb. as at Vienna.
 1 7 Faenza, 132 lb.

- 3 2 Fez, or Fesse, 96 lb. by Hunt wrote Feas, and noted as in Portugal.
 1 7 Ferrara, as Bergamo.
 Fio, 96 $\frac{1}{2}$ Rotuli, or Scutarii.
 1 7 Fiume, as Venice.
 1 8 Flanders, 110 lb. for the most part.
 1 7 Florence, 125 lb. of 12 Oz. to the lb.
 3 1 Forfori, 65 Rotuli.
 1 7 Forli, as Aquila.
 1 3 France generally 111 lb. except herein excepted.
 1 4 Frankford, { as Basil.
 1 4 Friburg, {
 1 8 Gaunt, as Ailost.
 1 8 Guelderland, 99 lb. The Places herein excepted.
 by Rooves, to a Quintal of 4 Rooves; and 4 lb. over.
 1 7 Genes, or Genoa, { 110 lb. a Quintal of Pepper.
 { 114 lb. a Quintal of Ginger.
 { 102 lb. Weight for Spice. A
 { Carga is 270 lb. Small weight, 85 lb. Great weight.
 1 4 Germany, a Centener of the small Weights is 100 lb. of the great 120 lb. and 132 lb. The Centener of 120 lb. is 5 Stone, of 24 lb. per Stone.
 2 6 Goa, as Portugal, by Quintals, Arrobes, or Rooves, &c. They have also another Weight, called Mao, which signifieth the Hand, and weigheth 12 lb. is used for Butter, Honey, Sugar, &c. in the Portugal Dominions.
 1 14 Granada, as Armaria bona.
 3 4 Guinea, as Cabo Verde.
 1 1 Hamburg, 96 lb. The Centener 120 lb. of 12 Stone, 1 Stone 10 lb. A Lippound 15 lb. and 20. Lippound 1 Skippound.
 1 4 Heidelberg, as Basil.
 1 4 Hertogenbosch, as Arschot.
 1 8 Holland, as Guelderland.
 1 8 Hulst, as Ailost.
 1 8 Ipree, as Ailost.
 1 7 Istria, as Venice.
 1 5 Laarta 87 Rotuli, 100 to a Cantar.
 1 5 Laconia, { 138 lb.
 { 78 $\frac{1}{2}$ Rotuli.
 1 7 Lansan, as Bergamo.
 1 5 Lavalona, 131 lb.
 1 4 Leon, 109 lb.
 1 5 Lepanto, { 156 lb.
 { 26 Rotuli, 1 Rotulus 6 lb.
 1 4 Leipsick, as Basil.
 1 10 Lisbon: See Calicut.
 1 8 Lisle, as Audenard.
 1 8 London, and all England, { 91 $\frac{1}{2}$ lb. Gros Weight of the Kintal Weight 112 lb.
 { 104 lb. Suble Weight.
 { 189 $\frac{1}{2}$ Marks of 8 Oz. Troy.
 1 8 Louwaine, as Arschot.
 1 1 Lubbeck, as Copenhagen.
 1 7 Luca, as Aquila.

- 100 lb. Ordinary Weight. A Centener is 112 lb.
102 lb. Almerick, or Weight of Geneva for Spices, abating 8 lb. per Cent.
94 $\frac{1}{2}$ lb. by the King's Weight to pay Custom by. A Quintal is 100 lb. A Charge 300 lb. A Somme 400 lb.
- 3 3 Medera, as Caba Verdo.
1 8 Malines, or Mecklin, as Arschot.
1 7 Mantua, as Aquila.
1 3 Marfeilles, 111 lb.
3 2 Maroco, or Morocco, as Cabe Verdo.
1 14 Medina del Campo, as Castile.
1 9 Melvin, 124 lb. The Last of Wheat 5200 lb. The Skippound and Stone, as Coningsberg.
100 lb. of 16 Oz. to the lb. which is the Princes Weight, called Zigoftatica.
96 lb. Merchants Weight.
184 lb. of 12 Oz. to the lb.
- 1 4 Meyfen,
1 7 Milan, as Cremona.
1 3 Mirabel, as Aquismort.
1 7 Mirandula, as Aquila.
1 7 Modena, as Faenza.
2 7 Molucco, 88 Rotuli, 112 a Cantar.
1 3 Montpellier, as Avignon.
1 4 Munchen, as Ausburg.
1 7 Naples, 120 l. and for Venice Gold 134 lb.
1 15 Narecca, 120 lb. A Lippound, or Stone, is 20 lb. and 20 Lippound a Skippound, that is 400 lb. used for Rye, but for Wheat but 350 lb. to a Skippound.
- 1 7 Nicofia, or Niebofia, as Archipelago.
1 5 Negropont, 119 lb.
1 4 Nurenburg, as Constance.
1 4 Norlingen, as Ausburg.
1 4 Offen, or Buda, as Basil.
94 Rotuli, 1 Cantar 5 Rooves,
1 Roove 20 Rotuli
138 lb. for Spices, 1 Cantar 4 Rooves.
3 2 Oran,
50 Rotuli for Corn, 1 Cantar 6 Rotuli.
61 Rotuli for Cotton-wool, 1 Cantar 15 Rotuli.
- 1 7 Orranto, } as Bergamo.
1 7 Padua,
1 3 Paris, 93 lb. accounting 4 Quarters of 25 lb. to the Hundred.
- 1 7 Parma, as Aquila.
1 4 Passau, 87 lb.
1 7 Pavia, as Cremona.
1 7 Pifa, as Venice.
1 6 Piedmont, } as Aquila.
1 7 Plaiſſance,
1 4 Poſen, as Breſlau.
1 8 Popering, as Ailoſt.
1 10 Portugal, 107 $\frac{1}{2}$ Rotuli, or Araters. The great Quintal is 128 lb. of 4 Rooves, 1 Roove 32 lb. The ſmall Quintal is 112 lb. of 4 Rooves, 1 Roove 28 lb. The Quintal of Wax 168 lb. which is 1 $\frac{1}{2}$ Quintal of 122 lb. of 4 Rooves of 42 lb. the Roove.
- 1 4 Prague, as Paſſau.
1 7 Puglia, as Calabria.
1 7 Ragufa,
1 7 Raviano, } as Faenza.
1 7 Ravenna,
1 7 Rechanati, 137 lb. but to Gold-thread, but 112 lb.
1 4 Regensbourgh, as Paſſau.
1 15 Revell, 120 lb. which is a Centener. The Skippound there is 400 lb.
2 1 Rhodes, 19 $\frac{1}{2}$ Rotuli, a Cantar is 100 lb.
1 9 Riga, 120 lb. a Lippound is 20 lb. and 20 Lippound a Skippound.
1 7 Rimano, as Faenza.
1 3 Roebel, 111 lb. and 119 lb. by the ſmall Weight.
1 7 Romagna, as Naples.
91 lb. by the Viconte, according as at Paris.
1 3 Rooven, or Roan, } 94 $\frac{1}{2}$ lb. by the Ordinary Weight, and 4 lb. per Cent.
1 4 Saltzbourg, } 111 lb. ſmall Weight.
1 3 St. Antoine, 127 lb.
1 8 St. Omar, as Audenarde.
3 3 St. Thomas, as Cabo Verde.
1 14 Saragoſſa, 112 lb. And the ſmall Quintal 131 lb.
1 7 Savoy, } 137 lb.
1 95 lb. ſmall Weight.
1 4 Saxony as Meiſen.
3 1 Sciba, as Antwerp, 320 lb. is there a Skippound.
2 1 Scio, as Fio.
1 13 Sequia, as Venice:
The great Quintal is 144 of 4 Rooves of 36 lb.
The leſſer Quintal is 120 lb. of 4 Rooves of 30 lb.
The ſmall Quintal is 112 lb. of 4 Rooves of 28 lb.
- 1 7 Sicilia 152 lb. of 12 Oz. per lb.
61 Rotuli of 30 Oz. is a Cantar of 24 Seſtertio's.
54 Rotuli for Fleſh by Talents of 12 Seſtertio's, is 30 Rotuli.
- 1 7 Sileſia, as Breſlaw.
1 13 Spoleto, as Venice.
1 4 Spires, as Bibrach.
1 4 Sterin 96 lb. The ſmall Stone 10 lb. The great Stone 21 lb.
The Centener 112 lb.
1 15 Stockholm 120 lb. The Skippound 320 lb. and alſo 340 lb.
The Centener 120 lb. The Stone 10 lb.
1 4 Straelfond 92 lb. The Stone 10 lb. and the Lippound 16 lb.
- 3 2 Suus, or Suſ, or Fez.
2 11 Syria 156 Mina's, a Mina 100 Drachms.
1 8 Tergos 107 lb.
1 3 Thoulouſe, as Avignon.
3 2 Thunes, or Tunis 63 Rotuli.
1 9 Thoren 120 lb. The Stone is 24 lb.
1 8 Tournay, as Ailoſt.
1 7 Treviſo, as Bergamo.
1 7 Trieſte, as Venice.
3 2 Tripoli, as Tunis.
2 11 Tripoli 26 $\frac{1}{2}$ lb.

- 106 lb. by Quintals of 4 Rooves of 30 lb. for Spices.
 1 14 *Valentia* } 134 by Quintals of 4 Rooves of 36 lb.
 The small Carga is 360 lb. that is, three Quintals of 120 lb.
 The great Carga is 432 lb. that is, three Quintals of 144 lb.
 98 $\frac{2}{3}$ lb. Great Weight, called *Ala Grossa*, used for Fleth, Butter, Cheese, Leather, Dates, Yarn, Copper, Thread, Iron, Oil, Brimstone and Wooll.
 1 7 *Venice* } 150 lb. Small Weight of 12 Oz. called *Ala Sotile*, most used for all Merchandize.

An Ounce is 8 Sassi, a Sassi 24 Carrats, 1 Carrat 4 Grains. They also account by Thousands, &c. with Allowance of 2 lb. *per Cent.* in the *Custom-house*.

- 1 Thousand 40 Mixti, 1 Mixti 25 lb.
 1 Carga 400 lb. 1 Starre 220 lb. The Starre is Mensural. Starres for Corn 130 lb. Ginger 180 lb. Railon, 260 lb. The Starre contains 54 Pottles of Wine at *Antwerp*.
 1 7 *Verons* 90 lb. And for Gold-thread 143 lb.

- 4 *Vienna* 85 lb. as at *Erfurd*; where also a Somme of Quicksilver is 275 lb.
 1 14 *Villaco*, as *Vellica* 80 lb.
 1 4 *Ulm*, as *Basil*.
 3 2 *Una* } 65 Rotuli for Cotton;
 75 Rotuli for Spices.
 94 Rotuli for Corn.
 1 7 *Urbis*, as *Bergamo*.
 1 8 *Walloon* Country, as *Ailost*.
 1 8 *Wassland*, as *Guelderland*.
 1 9 *Wilde*, as *Riga*.
 1 4 *Wisel*, as *Ausburgh*.
 3 1 *Zuidin* 77 Rotuli.
 1 8 *Zeland*, as *Guelderland*.
 3 1 *Zeroi* 50 Rotuli.
 1 8 *Zurich-see* 100 lb.

Foreign Weights for Money.

In *Florence*, they use a Weight for Gold and Silver; and at *Geneva* for Silver, called a Pound. of 12 Oz. 1 Oz. is 24 Deniers, and 1 Denier is 24 Grains: So is there 6912 Grains in the Pound.

In *Naples*, their Pound is likewise divided into 12 Ounces, and every Ounce into 8 Octany, or Octavos.

The Mark Weight is used in many other Places, and at *Antwerp* containeth 8 Ounces, and is heavier than their ordinary Pound by 5 upon the Hundred, as *Malines* saith.

This Mark is divided in a double Manner.

	Ounces.	English.	Grains.
(1) Mark.	8	160	5120
	Ounce.	20	640
		English.	32

	Ounces.	Penny-weights.	Grains.
(2) Mark.	8	192	4608
	Ounce.	24	576
		Penny weight.	24

The Mark Weights of some other Places subdivided.

FRANCE.

	Ounces.	Gross.	Deniers.	Grains.	Primes, or Garobs.	Seconds.	Tercier, or Malloquen.
Mark.	8	64	192	4608	110592	2654208	63700992
	Ounce.	8	24	576	13824	331776	7962624
		Gross.	3	72	1728	41472	995328
			Denier.	24	576	13824	331776
				Grain.	24	576	13824
					Garob, or Prime.	24	576
						Second.	24

In *France*, that Ounce is also divided into 2 Carrats, and every Carrat into 12 Grains.

Dantzick in Poland.

	Ounces.	Pence.	Heller.
Mark.	8	256	512
	Ounce.	32	64
		Penny.	2

Geneva for Gold.

	Ounces.	Deniers.	Grains.
Mark.	8	192	4608
	Ounce.	24	576
		Denier.	24

Meissen in Saxony.

	Ounces.	Deniers.	Grains, or Momenta.
Mark.	8	192	4608
	Ounce.	24	576
		Denier, or Penny.	24

Portugal.

	Ounces.	Oitavos, or Oitavos.	Great Gains.
Mark.	8	64	288
	Ounce.	8	36
		Oitavo, or Oitavo.	4 $\frac{1}{2}$

Nuremburgh in Germany.

	Ounces.	Loos.	Quints.	Primes.	Severtios.
Mark.	8	16	64	256	1024
	Ounce.	2	8	32	128
		Loot.	4	16	64
			Quint.	4	16
				Prime, Penny, or Nummulus.	4

Venice.

	Ounces.	Silicos, or Quarts.	Siliquas, or Carrats.	Grains.
Mark.	8	32	1151	4608
	Ounce.	4	144	576
		Silico, or Quart.	36	144
			Siliquas, or Carrat.	4

Spain. Gold.

	Ounces.	Castel- lanos.	Tomines.	Grains
Mark.	8	50	400	4800
	Ounce.	6 $\frac{1}{2}$	50	600
		Castel- lano.	8	96
			Tomine.	12

Spain. Silver.

	Ounces.	Drams, or Oitavo.	Grains.
Mark.	8	64	4800
	Ounce.	8	600
		Dram, or Oitavo.	75

Rome.

	Ounces.	Drams.	Scru- ples.	Obolos.	Sili- quas.	Primi, or Grains.
Mark.	8	64	192	384	1152	4608
	Ounce.	8	24	48	144	576
		Dram.	3	6	18	72
			Scru- ple.	2	6	24
				Obolus.	3	12
					Sili- qua.	4

Roman Libra, by Malines.

Libra	12	84	162	336	840	3320	5040
Ounces.		Guilders.	Denarij.	Victoriatas.	Sesteriis.	Asses.	Sextantis.

The Ton of Gold in *Latin*, *Tina*, seu *Tonna*, by some called *Roman*; but by *Alsted*, German, is thus divided.

Ton of Gold.	Pounds.	Marks.	Ounces.	Loots.	Drams.
	781 $\frac{1}{4}$	1562 $\frac{1}{2}$	12500	25000	100000
Pound.	2	16	32	128	
Mark.		8	16	64	
Ounce.			2	8	
			Loot.	4	

Scotland divides their Pound into 24 Deniers, 1 Denier 24 Primes, 1 Prime 24 Seconds, 1 Second 24 Thirds, 1 Third 24 Fourths, &c.

The Correspondency of 100 Marks of *Antwerp*, to the Places following.

	<i>Alder</i>	76 $\frac{1}{2}$ lb.
3	1 <i>Egypte</i>	94 Beffes
3	<i>Africa</i>	87 Marks
1	7 <i>Ancona</i>	103 $\frac{1}{4}$ Marks
1	7 <i>Aquila</i>	71 lb.
1	4 <i>Ausburgh</i>	105 $\frac{2}{3}$ Marks
1	4 <i>Bamberg</i>	103 $\frac{1}{4}$ Marks
1	4 <i>Bavaria</i>	
1	4 <i>Bohemia</i>	87 Marks
1	4 <i>Breslaw</i>	121 $\frac{1}{4}$ Marks
1	14 <i>Burgas</i>	116 $\frac{1}{2}$ Marks
1	7 <i>Calabria</i>	76 $\frac{1}{2}$ lb.
1	14 <i>Catalonia</i>	100 Marks.

1	4 <i>Cologne</i>	105 $\frac{2}{3}$ Marks
1	5 <i>Constantinople</i>	87 Marks
1	7 <i>Crema</i>	103 $\frac{1}{4}$ Marks
1	9 <i>Danzick</i>	
1	4 <i>Erfurd</i>	105 $\frac{2}{3}$ Marks
1	7 <i>Florence</i>	72 lb.
1	4 <i>Franconia</i>	103 $\frac{1}{4}$ Marks
1	4 <i>Frankford</i>	105 $\frac{2}{3}$ Marks
1	4 <i>Friburgh</i>	103 $\frac{1}{4}$ Marks
1	7 <i>Genes for Gold</i>	116 Marks
1	7 <i>Genova as Paris and Lyons</i>	77 Marks lb.
8	7 <i>Gracia</i>	105 $\frac{2}{3}$ Marks
1	4 <i>Hungary</i>	87 Marks
1	4 <i>Leipsick</i>	105 $\frac{2}{3}$ Marks
1	2 <i>London</i>	89 $\frac{1}{2}$ lb.
1	3 <i>Lyons</i>	112 Marks, Merchants Weight
		102 $\frac{1}{2}$ Marks, Merchants Weight. The King's Weight.
1	4 <i>Ments</i>	
1	4 <i>Meisen</i>	
1	7 <i>Millain</i>	
1	7 <i>Naples</i>	79 $\frac{1}{2}$ lb.
2	6 <i>Narvinga</i>	87 Marks
1	4 <i>Nurenburgh</i>	103 $\frac{1}{4}$ Marks
4	2 <i>Nova Spagnia</i>	87 $\frac{1}{4}$ Marks
1	3 <i>Paris, as Lyons</i>	
2	9 <i>Persia</i>	87 Mina's
4	3 <i>Peru</i>	87 $\frac{1}{2}$ Marks
1	7 <i>Piedmonte</i>	99 Marks
1	7 <i>Puglia</i>	76 $\frac{1}{2}$ lb.
1	7 <i>Rome</i>	103 $\frac{1}{4}$ Marks
1	4 <i>Saxon</i>	105 $\frac{2}{3}$ Marks
1	14 <i>Spain</i>	107 Marks
1	<i>Trevers, or Triers</i>	105 $\frac{2}{3}$ Marks
1	7 <i>Trevifo</i>	103 $\frac{1}{4}$ Marks
1	7 <i>Turin</i>	99 Marks
2	<i>Turkey</i>	87 Marks
3		
1	7 <i>Venice</i>	
1	7 <i>Verona</i>	
1	7 <i>Vicenza</i>	103 $\frac{1}{4}$ Marks
1	4 <i>Vienna</i>	105 $\frac{2}{3}$ Marks
1	4 <i>Ulm</i>	87 Marks
1	4 <i>Wissilbourg</i>	105 $\frac{2}{3}$ Marks
		103 $\frac{1}{4}$ Marks.

A TABLE of Grecian Attick Weights.

		Pounds Minas.	Ounces. Uncias.	Drams Drachmas.	Scruples Gram- mata.	Obolos.	Lupines Termes.	Kiratas Siliquas.	Aereolas Chalkos.	Grains. Sitar.	Minutes Leptos.
Talent.	Greater.	80	1000	8000	24000	48000	72000	144000	288000	576000	2016000
	Lesser.	60	750	6000	18000	36000	54000	108000	216000	432000	1512000
Mina.	New		12 $\frac{1}{2}$	100	300	600	900	1800	3600	7200	25200
	Old.		9 $\frac{3}{8}$	75	225	450	675	1350	2700	5400	18900
a											
Uncia				8	24	48	72	144	288	576	2016
b											
Drachm					3	6	9	18	36	72	252
c											
Gramma						2	3	6	12	24	84
d											
Obolus.							1 $\frac{1}{2}$	3	6	12	42
e											
Therme								2	4	8	28
Lupine.											
f											
Siliqua									2	4	14
g											
Kiration.											
Chalkus										2	7
h											
Aerolus.											
i											
Sitar											3 $\frac{1}{2}$
k											

Grecian Physical Weights.

		Uncias. Ounces.	Drachmas. Drams.	Scruples. Gram- mata.	Obolos.	Lupines.	Carobseeds. Keratis. Siliquas.	Aerola. Chalkos.	Grains. Sitar.	Minutes. Leptas.
Mina.		16	128	384	768	1152	2304	4608	9216	32256
	Litra.	12	96	288	576	864	1728	3456	6912	24192
aa										
Uncia.			8	24	48	72	144	288	576	2016
b										
Drachm.				3	6	9	18	36	72	252
c										
Gramma.					2	3	6	12	24	84
d										
Obolus.						1 $\frac{1}{2}$	3	6	12	42
e										
Lupine.							2	4	8	28
f										
Siliqua.								2	4	14
g										
Keratis.										
Carobseed.									2	7
h										
Chalkus.										
i										
Aerolum.										
j										
Sitar.										3 $\frac{1}{2}$
k										

Grecian Hippatrick or Farriers Weights.

	Ounces.	Denari- ons.	Drams.	Scr- uples.	Obolos.
Mina.	15	84 $\frac{3}{4}$	112 $\frac{1}{2}$	337 $\frac{1}{2}$	675
Litra.	12	67 $\frac{1}{2}$	90	270	540
aaa Ounce.	5 $\frac{5}{8}$	7 $\frac{1}{2}$	22 $\frac{1}{2}$	45	
		Denari- on.			
		bb	Dram.		
			cc	Scr- uple.	
					II

a. The Mina of 100 Drachms is called *Solon's Mina*, because thought to be continued by him sometime turned into *Latin* by *Mina*, often by *Libra*, tho' *Libra* be 4 Drachms lighter, the *Roman Libra* being but 96 *Attick* Drachms. The old *Mina* of 75 Drachms, now obsolete, for Memory sake, hath found Room in this Table.

aa. The Physicians, as by *Dioscorides* and *Galen* appears, used a *Mina*, or Pound of 16 Ounces, and a *Litra* or other Pound of 12 Ounces, conceived all one with the *Roman Libra*, consisting of 96 Drachms, as they did; and by Interpreters commonly rendred *Libra*, and seldom or never *Mina*; and *Mina*, and *Litra*, as also *Libra* commonly englished a Pound.

aaa. The Hippatrick had a *Mina* of 15 Ounces and a *Litra* of 12.

b. *Oungia*, in *Latin* *Uncia*, must not be taken for our Ounce, but for one of their Ounces, arising by the Division of their Pound into Drachms differently, according to the Quantity of Drachms in one Pound.

bb. Among the Hippatrick Weights there was a *Denarium* of 4 Scruples, 5 $\frac{1}{2}$ whereof made one of their Ounces.

c. *Drachme*, *Drachma*, and *Dragma*, in *Greek* and *Latin*, in *English* a *Dram*, is the 8th Part of their Ounce, whereby the Pound hath 12 or 16 Ounces therein. By *Asted* made to equal the *German Weight Quinclein*. Some call a *Dram Resolus* some *Holke*, from the *Greek ἀρχή*.

cc. The Ounce Hippatrick, that divided as well the *Mina* of 15 Ounces, as the *Litra* of 12 Ounces had but 7 $\frac{1}{2}$ Drams into it.

d. Drams of all sorts were parted into 3 Scruples. A Scruple in *Greek* sometime *Gramma*, sometimes *Grammata*; in *Latin* *Scriptulum*, *Scriptulum*, and *Scrupulum*.

e. *Obolus*, sometime a Weight, sometime a Piece of Money commonly rendred an Half Penny, because always was the half of a Scruple.

f. *Lupine*, in *Greek* *Therma's*, was a Weight equal in poise to the *Lupine*, which is a Seed grow-

ing in a Cod like to a Pease, and both Plant and Seed bear that Name. And seeing there are many sorts, as *Perkinson's Theater of Plants*, Page 1073, which sort of *Lupine* is meant, is uncertain; probably, the middle White, which are most in use, bigger than the Yellow, and not so big as the great Blue; and from the nearness in Weight thereto, if not exactness, might be so called.

g. gg. *Siliqua*, in *Greek* *Keration*, a Weight, a like heavy to the Carobseed or sweet Bean, common in many Countries subject to the *Grecian Empire*. Sometime called *Carat* or *Caract*, from whence the Word is still in use with us.

b. *Chalkos*, in *Latin* *Aerolis* and *Aerolum*. *Aerolis* was also a Piece of Brass Money current in ancient Times among those Countries of the *Grecian* Dominion.

i. *Sitar*, a Grain of Corn from *Σίτη* *Frumentum*, likely to have been the Original of their Weight, two whereof make one *Chalkos*.

k. *Lepton*, from *Leptos*, in *Latin* *Minutum*, and *Minutia*, supposed to be some small Scale of the Rhind or Bark of some Tree, 3 $\frac{1}{2}$ balanced the *Sitar*.

l. Besides these, in the Table of Physical Weights some Books mention the *Assarian*, allowed for two Drachms, which is $\frac{1}{2}$ part of an Ounce. Also, the *Exagion* wrote sometime *Stagion*, sometime *Agion* for Brevity, which was the *Roman Sextula*, the 6th part of their Ounce, whereof 12 make the *Litra*. Likewise *Orobis*, which was a Grain of a wild Vetch. And *Phaïke* a *Lentil*; but whether Weights or no, is not worth the Enquiry.

ll. As the other Weights are divided into lesser Divisions, than the *Obolus*, so no doubt but the *Hippatrick* also were, and may accordingly be done, when occasion serves. The *Obolus* of all sorts admitting the like smaller Denominations.

Grecian Exotick Weights.

	Mention'd by <i>Verruvius</i> , suppos'd to be <i>Thracian</i> , or <i>Byzantium</i> Talent.	120	
Talents	Several mentioned by <i>Hesychius</i> .	100	} <i>Libras.</i>
		125	
		165	
		405	
		1150	
Old	} <i>Sicilian (m)</i>	24	} <i>Minas.</i>
New		12	
Talent of	<i>Alexandria</i>	12000	} <i>Attick Drams.</i>
	<i>Aegina</i>	10000	
	<i>Corinth</i>	8000	
	<i>Egypt</i>	7000	
	<i>Babylon</i>	4500	
	<i>Rhodium</i>	4000	
	<i>Euboeicum</i>	1500	
	<i>Syria</i>	20	
Mina	<i>Alexandria</i> <i>Ptolemaica</i>	18	} <i>Uncias</i>
Drachma	<i>Egyptia</i>	1	

A Table of the Roman Weights.

	<i>Minas.</i>	<i>Libras.</i>	<i>Uncias.</i>	<i>Semiunc.</i>	<i>Duellis.</i>	<i>Sicilicis.</i>	<i>Sextant.</i>	<i>Denarios.</i>	<i>Drachms.</i>	<i>Quinars.</i>	<i>Scruples.</i>	<i>Quadr.</i>	<i>Sext.</i>	<i>Obol.</i>	<i>Siliq.</i>	<i>Grains.</i>
<i>Talent.</i>	75	152	150	3000	4500	6000	9000	10500	12000	21000	36000	42000	63000	72000	216000	864000
<i>Mina.</i>	$1\frac{2}{3}$	20	40	60	80	120	140	160	160	280	480	560	840	960	2880	11520
<i>Libra.</i>	12	24	36	48	72	84	96	168	96	168	288	336	504	526	1728	6912
<i>Uncia.</i>	a	2	3	4	6	7	8	14	8	14	24	28	42	48	144	576
<i>Semiuncia.</i>	b	$1\frac{1}{2}$	2	3	$3\frac{1}{2}$	4	7	12	4	7	12	14	21	24	72	288
<i>Duella.</i>	c	$1\frac{1}{2}$	2	$2\frac{1}{3}$	$2\frac{2}{3}$	4	$4\frac{2}{3}$	8	$9\frac{1}{3}$	14	16	24	48	48	144	576
<i>Sicilium.</i>	d	$1\frac{1}{2}$	2	$1\frac{3}{4}$	2	$3\frac{1}{2}$	6	7	$10\frac{1}{2}$	12	36	72	144	144	432	1728
<i>Sextula.</i>	e	$1\frac{1}{2}$	2	$1\frac{3}{4}$	2	$3\frac{1}{2}$	6	7	$10\frac{1}{2}$	12	36	72	144	144	432	1728
<i>Denarius.</i>	f	$1\frac{1}{2}$	2	$1\frac{3}{4}$	2	$3\frac{1}{2}$	6	7	$10\frac{1}{2}$	12	36	72	144	144	432	1728
<i>Drachm.</i>		$1\frac{1}{2}$	2	$1\frac{3}{4}$	2	$3\frac{1}{2}$	6	7	$10\frac{1}{2}$	12	36	72	144	144	432	1728
<i>Quinar.</i>	g	$1\frac{1}{2}$	2	$1\frac{3}{4}$	2	$3\frac{1}{2}$	6	7	$10\frac{1}{2}$	12	36	72	144	144	432	1728
<i>Scruple.</i>	h	$1\frac{1}{2}$	2	$1\frac{3}{4}$	2	$3\frac{1}{2}$	6	7	$10\frac{1}{2}$	12	36	72	144	144	432	1728
<i>Quadrans.</i>	i	$1\frac{1}{2}$	2	$1\frac{3}{4}$	2	$3\frac{1}{2}$	6	7	$10\frac{1}{2}$	12	36	72	144	144	432	1728
<i>Sextans.</i>	k	$1\frac{1}{2}$	2	$1\frac{3}{4}$	2	$3\frac{1}{2}$	6	7	$10\frac{1}{2}$	12	36	72	144	144	432	1728
<i>Obolus.</i>	l	$1\frac{1}{2}$	2	$1\frac{3}{4}$	2	$3\frac{1}{2}$	6	7	$10\frac{1}{2}$	12	36	72	144	144	432	1728
<i>Siliqua.</i>		$1\frac{1}{2}$	2	$1\frac{3}{4}$	2	$3\frac{1}{2}$	6	7	$10\frac{1}{2}$	12	36	72	144	144	432	1728

a. *Libra*, called also *As*, by Translators commonly rendred a Pound, was divided into 12 Ounces, and for every Number of Ounces under 12, a proper Name used, as,

Deunx, _____ 11
Dextans and Decunx, _____ 10
Dodrans, _____ 9

** *Bes*, *Bessis*, and of old, *Des*, _____ 8
Septunx, _____ 7
Semis, *Semissis*, *Semissius*, *Selibra*, and *Semibella*, _____ 6
Quincunx, _____ 5
Triens, _____ 4
Quadrans and Triunx, _____ 3
Sextans, _____ 2
Uncia, _____ 1

Ouncer.

Malines, p. 24. of his *Lex Mercatoria*, divides *Pondus*, which he calls the Old Pond of the Romans, into

84 Denario's.
129 Quinario's.
256 Sestertio's.
640 Asfes.
1280 Semilibella's.
2560 Teruncio's.

A Reason is wanting, why *Legat* makes the Roman *Libra* of 12 Oz. but $10\frac{1}{2}$ Oz. *Troy*, since if he reckon by the Number of Grains (the Original of Weights) at 5760 Grains of *Affize* in the Pound *Troy*, it can be but 10 Oz. just; for 10 times 6912, the Grains in a Roman Pound, and 12 times 5760 are equal: But if he count the Pound *Troy* at 7680 Grains, according to the Statute at 32 Grains of Wheat to a Penny-weight, the *Troy* Pound will be $13\frac{1}{3}$ Oz. Roman.

Pound, *Malines*, p. 24. afore said, makes the *Bes*, or old Mark of the Romans, to be divided into

16 Loor, or Tetrachms.
23 $\frac{1}{2}$ Tridrams.
32 Didrams.
64 Drachms.
96 Obolos, or Treobolos.
128 Triobolos.
384 Obolos.
768 Miobolos.
3840 Moments.

b *Semiuncia*, or the Half-Ounce, is sometimes called *Affarion*, and *Affarius*, and by *Alfred*, *Lotho*, answering to a German Weight of that Name.

c *Duella* being double to the Weight of the *Sextula*, sometimes called *Bina Sextule*.

d *Sicilicum*, or *Sicilicus*, and by Abbreviation, *Siclus*, is $\frac{1}{3}$ of an Ounce.

e *Sextula*, us'd promiscuously with *Sextans*, and understood by Import of the Name to be the sixth Part.

f *Denarius*,

** *Bes*, is the Mark Weight, two Thirds of the

f *Denarius*, a Penny-weight, the 7th Part of an Ounce, whether used to weigh any thing but Money, as other; the Divisions thereof, somewhat questionable, see among the Money. *Alsted* compares the *Drachmal Denarius* to the German Weight *Quintlein*.

g *Quinar*, was half the Penny-weight, and a Piece of Money set afterward among the Roman Coin.

h Between the *Quinar* and *Scruple* some mention a Weight called *Tremissis*, containing 32 Grains, being the 18th Part of an Ounce.

i *Quadrans*, here is $\frac{1}{4}$ of a Penny-weight, and so called *Quadrans Denarii*, to distinguish it from *Quadrans Librae*, which was 3 Oz.

k *Sextans*, called *Sextans Denarii*, to difference it from *Sextans Librae*, was the 6th Part of the Penny-weight, and sometime called *Sextula*.

l *Obolus*, or half a *Scruple*, called sometimes *Simplium*, weight 12 Grains. If there be another *Obolus*, as some say, which was the third Part of a *Quinar*, it seems to be a Piece of Coin, and must weigh $13\frac{1}{2}$ Grains, and so is all one with the *Sextans*, according to the *Tabular* Division; yet this sort of *Obolus*, they make to contain but 10 Grains.

Between the *Obolus* and the *Siliqua*, some mention a *Cerates*, which they say contains six Grains, and so is $\frac{1}{2}$ the *Obolus*, or $\frac{1}{3}$ of the *Scruple*.

A Table of the Scripture-Weights, from Bishop Cumberland.

1. A Shekel of Silver was just half the Roman Ounce, or our half Ounce *Averdupois*, and was equal to 219 Grains *Troy*; and its Value in our Money was 28 Pence, or 2 Shillings, 4 Pence, Farthing, and near $\frac{1}{2}$ Part of a Farthing; from whence 'tis easie to know the half and quarter Shekel.

2. The half Shekel was called *Bekob*.

3. Its 20th Part was called *Gerah*, *Agurah*, and *Keshibrah*, and is well translated by *Obolus Atticus*.

4. A Talent of Silver was 3000 Shekels, and in our Money its Value was 353 l. 11 s. 10 d. $\frac{1}{2}$.

5. A Talent of Gold was in Value of our Money 5076 l. 3 s. 10 d.

6. The *Maneh* was in Weight 100 Shekels, in Value or Coin 60 Shekels.

7. The Golden *Darios* or *Persian Drachmon*, was in Weight 12 *Gerahs*, in Value 1 l. 0 s. 4 d.

8. The Roman Silver *Denarius* was 7 d. 3 f. Gold Coins double in Weight.

9. The Roman Brazen or Copper *As*, was of $\frac{1}{2}$ an Ounce Weight; in Value 3 Farthings, and one Tenth of our Farthing.

10. *Affarium* was the Half of the *As*, viz. 1 f. 55 nearly.

11. The *Quadrans* was in Value about 3 quarters of a Farthing.

12. The *Mite* or *Λεπτον*, was the Half of the *Quadrans*, in Value about $\frac{1}{2}$ of our Farthing.

WENDING, is a Term for bringing a Ship's Head about, and seems only to be a Corruption from Winding. They say, *How Wends the Ship?* i. e. Which way does her Head lie?

WEST *Erect-Dials*: See *Direct Dials*.

WHEEL, or Way-wiser, an Instrument to measure Lengths upon the Ground: See *Perambulator*.

WHEEL-Barometer: See *Barometer*.

WHEEL-Fire, is the same with what the Chymists call *Ignis Rotæ*; that is, a Fire which covers the Crucible, Copple, or Melting-pot, entirely over; at Top, as well as round the Sides.

WHELPS; so the Seamen call those Brackets which are set up on the Capstan, close under the Bars, and they give the Sweep to it, and are so contrived, that the Cable winding about them, may not surge so much as it would do, if the Body of the Capstan were quite round and smooth.

WHIP, or *Whip-staff*, in a Ship, is a Piece of Wood fastned into the Helm, for him that steers to hold in his Hand, thereby to move the Helm, and steer the Ship. It goes through the Rowl, and is made fast to the Tiller with a Ring. But this is not used in great Ships.

WHITE-LEAD, how made: See *Ceruse*.

WHITENESS: This Colour, Mr. Boyle thinks, doth chiefly depend upon this, That the Surfaces of white Bodies are separated into innumerable small Planes or Superficies, which being of a Nature nearly specular, are also so placed, that some looking one way, and some another, do reflect the Rays of Light falling upon them, not towards one another, but outwards, towards the Spectator's Eye. But the Account of Whiteness, according to the *Newtonian* Hypothesis of Light and Colours, is, That 'tis the Result of the Mixture of all sorts of Rays of Light together: See *Colours and Light*.

WHOODINGS, in a Ship, are those Planks which are joined and fastned along the Ship's Side into the Stern.

WILL, or *Last Will*: See *Testament*.

WIND, at Sea, they call bringing a Ship's Head about, *Winding of her*; and when she comes to ride at Anchor, she is said to *Wind up*: Also when she is under Sail, they use to require, *How she Winds*, i. e. which way she lies with her Head? So, to *Wind the Boat*, is to turn her Head about.

WIND is defin'd to be the Stream, or Current of the Air; and where such Current is perpetual and fix'd in its Course, 'tis necessary that it proceed from a permanent unintermitting Cause. Wherefore some have been inclined to propose the Diurnal Rotation of the Earth upon its Axis, by which, as the Globe turns Eastwards, the loose and fluid Particles of the Air, being so exceeding light as they be, are left behind, so that in respect of the Earth's Surface, they move Westwards, and become a constant Easterly Wind. This Opinion seems confirmed, for that these Winds are found only near the *Equinoctial*, in those Parallels of Latitude, where the Diurnal Motion is swiftest; but the constant Calms in the *Atlantick Sea*, near the *Aequator*, the Westerly

Westerly Winds near the Coast of *Guinea*, and the periodical *Westerly Monsoons* under the *Equator* in the *Indian Seas*, seemingly declare the Insufficiency of that Hypothesis.

Besides, the Air being kept to the Earth by the Principle of *Gravity*, would in time, acquire the same Degree of Velocity, that the Earth's Surface moves with, as well in respect of the Diurnal Rotation, as of the Annual about the Sun, which is about 30. times swifter.

It remains therefore to substitute some other Cause, capable of producing a like constant Effect, not liable to the same Objections, but agreeable to the known Properties of the Elements of Air and Water, and the Laws of the Motion of Fluid Bodies. Such an one is the Action of the Sun's Beams upon the Air and Water, as he passes every Day over the Oceans, consider'd together with the Nature of the Soil, and Situation of the adjoining Continents.

Therefore, according to the Laws of *Statics*, the Air, which is less rarified or expanded by Heat, and consequently more ponderous, must have a Motion round those Parts thereof, which are more rarified, and less ponderous, to bring it to an *Equilibrium*; also, the Presence of the Sun continually shifting to the Westward, that Part towards which the Air tends, by reason of the Refraction made by his greatest Meridian Heat, is with him carried westward, and consequently the Tendency of the whole Body of the lower Air is that way.

Thus a general Easterly Wind is formed, which being impressed upon all the Air of a vast Ocean, the parts impel one the other, and so keep moving till the next Return of the Sun, whereby so much of the Motion as was lost, is again restored, and thus the Easterly Wind is made perpetual.

From the same Principle it follows, that this Easterly Wind should on the North-side of the *Equator*, be to the Northwards of the East, and in South Latitudes to the Southwards thereof; for near the Line, the Air is much more rarified, than at a greater distance from it; because the Sun is twice in a Year vertical there, and at no time distant above 23. Degrees $\frac{1}{2}$; at which Distance the Heat being at the Sine of the Angle of Incidence, is but little short of that of the perpendicular Ray. Whereas under the Tropicks, though the Sun stay long vertical, yet he is a long 47 Degrees off; which is a kind of Winter, wherein the Air so cools, as that the Summer Heat cannot warm it to the same Degree with that under the Equator. Wherefore the Air towards the Northward and Southward being less rarified than that in the middle; it follows, that from both sides it ought to tend towards the Equator. This Motion compounded with the former Easterly Wind, answers all the Phenomena of the general Trade Winds; which, if the whole Surface of the Globe were Sea, would undoubtedly blow all round the World, as they are found to do in the *Atlantick* and *Æthiopic* Oceans.

But seeing that so great Continents do interpose and break the Continuity of the Oceans, regard must be had to the Nature of the Soil, and the Position of the high Mountains, which are the two principal Causes of the several Variations of the Wind from the former general Rule; for if a Country lying near the Sun, prove to be flat, sandy, and low Land, such as the De-

sarts of *Libya* are usually reported to be, the Heat occasioned by the Reflexion of the Sun's Beams, and the Retention thereof in the Sand, is incredible to those that have not felt it; whereby the Air being exceedingly rarified, it is necessary that this cooler and more dense Air should run thitherwards to restore the *Æquilibrium*: This is supposed to be the Cause, why near the Coast of *Guinea* the Wind always sets in upon the Land, blowing Westerly instead of Easterly, there being sufficient Reason to believe, that the inland Parts of *Africa*, are prodigiously hot, since the Northern Borders thereof were so intemperate, as to give the Ancients cause to conclude, That all beyond the *Tropicks* was made uninhabitable by Excess of Heat.

From the same Cause it happens, that there are so constant Calms in that part of the Ocean, call'd the *Rains*; for this Tract being placed in the middle, between the Westerly Winds, blowing on the Coast of *Guinea*, and the Easterly Trade Winds blowing to the Westwards thereof, the Tendency of the Air here, is indifferent to either, and so stands in *Æquilibrium* between both, and the weight of the incumbent Atmosphere, being diminished by the continual contrary Winds blowing from hence, is the Reason that the Air here holds not the copious Vapour it receives, but lets it fall in so frequent Rains.

But as the cool and dense Air, by reason of its greater Gravity, presses upon the hot and rarified, 'tis demonstrative, that this latter must ascend in a continued Stream, as fast as it rarifies, and that being ascended, it must disperse it self to preserve the *Æquilibrium*; that is, by a contrary Current the upper Air must move from those Parts where the greatest Heat is; so by a kind of Circulation, the North-East Trade-Wind below, will be attended with a South-westerly above, and the South-easterly and North-west Wind above; that this is more than a bare Conjecture, the almost instantaneous Change of the Wind to the opposite Point, which is frequently found in passing the Limits of the Trade-Winds, seems to assure us; but that which above all confirms this Hypothesis, is the Phenomenon of the *Monsoons*, by this means most easily solv'd, and without it hardly explicable.

Supposing therefore such a Circulation as above, 'tis to be considered, that to the Northward of the *Indian Ocean*, there is every where Land within the usual Limits of the Latitude of 30, viz. *Arabia*, *Persia*, *India*, &c. which for the same Reason, as the *Mediterranean* Parts of *Africa*, are subject to unufferable Heats, when the Sun is to the North, passing nearly vertical; but yet are temperate enough when the Sun is remov'd towards the other *Tropick*, because of a Ridge of Mountains at some distance within the Land, said to be frequently in Winter covered with Snow, over which the Air as it passes, must needs be much chilled.

Hence it comes to pass, that the Air coming according to the general Rule, out of the North-East in the *Indian Sea*, is sometimes hotter, sometimes colder, than that which by this Circulation is return'd out of the South-west, and by consequence sometimes the under Current, or Wind, is from the North-East, sometimes from the South-West.

That this has no other Cause, is clear from the Times wherein these Winds set in, *viz.* in *April*, when the Sun begins to warm those Countries to the North, the South-west *Monsoons* begin, and blow during the Heats till *October*; when the Sun being retired, and all things growing cooler Northward, and the Heat increasing to the South, the North-East enter and blow all the Winter till *April* again: And it is undoubtedly from the same Principle that to the Southward of the *Equator* in part of the *Indian Ocean*, the North-West Winds succeed the South-East, when the Sun draws near the *Tropick of Capricorn*.

But in this latter occurs a Difficulty, not well to be accounted for, which is, why this Change of the *Monsoons*, should be any more in this Ocean, than in the same Latitudes in the *Aethiopic*, where there is nothing more certain than a South-East Wind all the Year.

'Tis likewise very hard to conceive why the Limits of the Trade Wind should be fix'd about the thirtieth Degree of Latitude all round the Globe; and that they should so seldom transgress or fall short of those Bounds; as also that in the *Indian Sea*, only the Northern Part should be subject to the changeable *Monsoons*, and in the Southern there should be a constant South-East.

This Account of Wind is from the Learned Captain *Halley's* Discourse on this Subject *Philosoph. Transf. N. 183.*

WIND-GUN. Of this Instrument there are several Descriptions extant, but the following of Mr. *Papins* is in all respects the best. (See Continuation of Mr. *Boyle's Physico-Mechanical Experiments.* Part 2. Iconism. 2. Fig. 4.)

AA, is a Copper Globe, hollow within; BB is a Tube, fastned to that Globe. F is a Valve opening inwardly, and shutting the Globe BB; G is the Spring depressing the foresaid Valve. H is a Gnomon affixed to the Globe AA, and making fast the Spring G.

CC, is a Tube of Iron, fastned to the Tube BB, and the Globe AA. DD is a Plug exactly adapted to the foresaid Tube. EEE is another Plug, fitted also to the Tube BB with an Iron Wire, reaching almost to the Valve F. R is the Protuberance of the Tube CC, somewhat hollowed above to receive the End of the Iron LL; and LL, is a crooked Iron, moving about the Extremity in R, so that it is like a Leaver to lift up the Plug EEE. OPO is a crooked Iron, fastned in M, that the Thumb sticking in the Angle P, the rest of the Fingers may attract the Leaver L, and so force the Plug EEE upwards. But the Use of the Curvature is, that the one End O might be applied to the Shoulder, if it be thought fit to aim at any Mark.

TT, is a Rectangle of Iron, encompassing the Leaver LL, and the Iron OPO, to keep the Leaver in that Posture which the present Scheme holds forth; for otherwise the Plug EEE would be thrust out far away, whilst we intrude the Air into the Globe AA.

II, is an Elliptick Hole in the upper Part of the Globe very well shut with a Valve, opening inwardly, whose Use is to give liberty of Inspection and of amending what is amiss; for the Valve may be drawn through the Hole, by reason of its Elliptick Figure.

SS, is a metalline Plate transversly placed above the Hole II, and perforated to transmit the Screw V, by whose help the Valve shutting, the Hole II is sustained, and is applied closely to the Hole.

Q, is an Hole in the inferior part of the Tube CC, by which the Air enters into the Tube, whilst the Plug D is brought to the lowest part of the Tube.

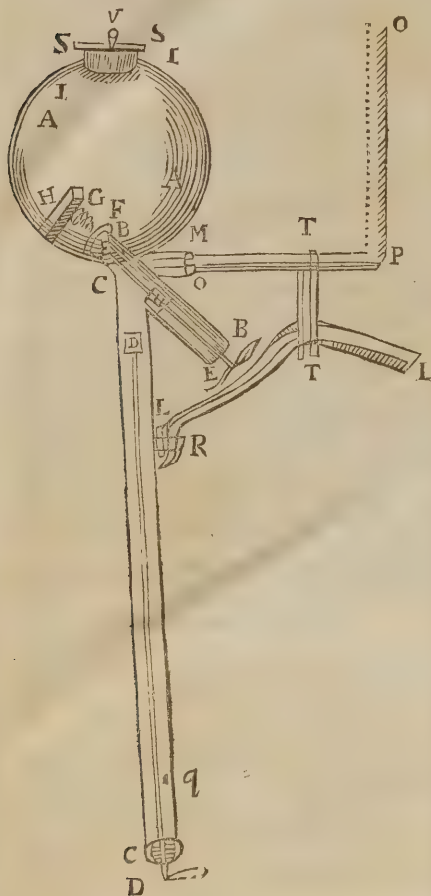
The Air is thrust into the Engine after this manner: The crooked End of the Plug DD is pressed upon with the Foot, that it mayn't stir from the Ground; and the Engine being lifted upward till the upper part of the Plug be found below the Hole Q; then the Air entering through the foresaid Hole, doth wholly fill the Tube CC.

Then the Engine being forcibly depressed, the Air contain'd in the Tube CC, opens the Valve F, and is thrust into the Globe AA; whence it cannot return, because the Valves presently stop the Passage; and thus by iterated Turns, we may condense the Air in the Globe, until the Force of its Spring cannot be overcome by our Strength.

Now to discharge the Air, so condensed, the Plug DD is wholly to be drawn out, and a Bullet of Lead to be put into the bottom of the Tube CC, then by means of the Leaver LL, the Plug EEE is to be impelled upward, as beforemention'd, and then the Extremity of the Iron Wire opens the Valve B, and the Air breaking out therefrom, expels the Leaden Bullet through the Tube CC with great Violence.

Note. That before the Plug DD is again put into the Tube CC from the Compression of the Air, about half an Ounce of Water is to be poured into the foresaid Tube. For by this means no Air at all can escape out by the Plug; and moreover, that Water filling exactly the upper part of the Tube CC, will cause that the whole compressed Air will be intruded within the Cavity AA, and so the Condensation will be perfected much sooner than if at every Turn part of the compressed Air did remain below the Valve F. See the Figure following.

This



This Engine is much better than any Wind-Guns hitherto mention'd in Print.

1. Because that seeing one only Valve serves both for letting in, and discharging forth of the Air, it is less subject to be spoiled or impaired, than if two Valves were used for that Purpose.

2. If any Disorder happen in other Guns, the Engine remains useles; but here by the Elliptick Hole, a Man may take out the Spring and the Valve, and so mend whatsoever is amiss.

3. In other Guns, the Valves being cover'd with Leather, were put in before the Engine was on every side shut, and therefore Silver Solder could not be used in cementing the Parts, but only Lead Solder; by which the Air, being much compress'd, could by no means be restrain'd: But here all things are well cemented with Silver Solder, without danger of Burning, in regard the Valve cover'd with Leather is put in afterward through the Elliptick Hole II.

4. But this Engine is chiefly to be preferred before others on this account, because we emit several Bodies into the Receiver, through the Ellip-

tick Hole, and so make many Experiments in highly compressed Air.

WIND-Taught, a Sea Term, implying as much as Stiff in the Wind; for they say a thing is *Taught*, when 'tis Stiff. Thus too much Rigging, all high Ropes, or any thing catching or holding Wind aloft, is said to hold a Ship *Wind-taught*; by which they mean, that the sloop too much in her Sailing in a stiff Gale of Wind. So also, when a Ship rides in a main Stress of Wind and Weather, they strike down her Topmasts, and bring her Yards down alongst the Ship, which else would hold too much Wind, or be *Wind-taught*.

WINDING Tackle-Blocks; so the Seamen call those *double Blocks*, with three *Shivers* in each, which are seized fast to the End of a small Cable which is brought about the Head of the Mast, and so serves instead of a Pendant. This hath a *Gay* brought to it from the Foremast. Into the Block is reeved a Hawser, which is also reeved through another double Block, having a Strap at the End of it, which being put through the Eye of the Slings, is lock'd into it with a *Fidd*, in order to hoist in Goods. The *Fall* of this Tackle is reeved into the *Snatch Block*, and so is brought to the Capstan, whereby the Goods are heaved.

WINDLASS, in a Ship, is a piece of Timber having six or eight Squares, and is fix'd abaft the Stern aloft, where the Cables come in from the one Side of the Ship to the other, used now in small Ships only, and in the *Flemish* Ships, which are highly mann'd: But this *Windlass* will purchase more by much than any Capstan in the weighing of an Anchor, and without any Danger to those that heave, because they heave here about with Handspikes put into the Hole at either End of the *Windlass*; of which, tho' one should happen to break, yet would the *Windlass* paul of it self, without any farther Danger.

WING: The Romans called by the Name of *Ala*, the *Wings*, two Bodies of Men in their Army, one on the Right, and the other on the Left, consisting each of 400 Horse, and 4200 Foot usually; and being wholly made up of Confederate Troops: These were design'd to cover the *Roman* Army, as the Wings of a Bird cover its Body. The Troops in these Wings they call *Alares*, and *Alares Copia*; and we at this Day distinguish our Armies into the Main Body, the Right and Left Wings.

WINGS, in Fortification, are the large Sides of Horn-works, Crown-works, Tenailles, and the like Out-works; that is to say, the Ramparts and Parapets, with which they are bounded on the Right and Left, from their Gorge to their Front. These Wings or Sides are capable of being flank'd either with the Body of the Place, if they stand not too far distant; or with certain Redoubts, or with a Traverse made in their Ditch.

WINTER Solstice: See *Solstice*.

WITHERNAM, is the taking or driving of a Distress to the Hold, or out of the County, so that the Sheriff cannot upon Replevin make Delivery thereof to the Party distrained: In which Case, a Writ of *Withernam* is directed to the Sheriff for the taking of as many of his Beasts that did thus unlawfully distrain, or as much Goods of his into his keeping, until he hath made Deliverance of the first Distress. Also, if the Beasts be in a Fortlet or Castle, the Sheriff may take with him

the Power of the County, and beat down the Castle.

Witbernam, in some Statutes, seems also to signify an unlawful Distress made by him that has no Right to Distrain.

WITT. Mr. Locke, in his *Essay on Humane Understanding*, B. II. C. XI. Sect. 2. defines *Witt* (and thereby distinguishes it from *Judgment*) to be a quick and ready Assemblage of Ideas; and putting those together with great Facility and Variety in which can be found any Resemblance and Congruity, thereby to make up pleasant Pictures and agreeable Images in the Fancy. Hence it is that Metaphors and Allusions are so generally entertaining and pleasing; because their Beauty appears at first sight, and there is required no Labour and Toil of Thought to examine what Truth or Reason there is in them.

WOOD and *Wood*, a Sea Term of two pieces of Timber; being so let into each other, that the Wood of one joins close to the other.

WORM; is that winding long Pewter Pipe which Apothecaries and Distillers place in a Tub of Water to cool and condense the Vapours in Distillations of Spirits. Formerly, and sometimes now, this Worm, or something like, was placed above the Head of the Still, and then a Refrigeratory at the upper end of it, which is very good to

distil Spirit of Wine, and such fine Spirits. This the Chymists call a Serpentine.

WORMING, at Sea, is laying all along a small Line or Rope betwixt the Shrouds of any Cable or Hawser, in order to strengthen it; or, as the Seamen call it, *Succour it*.

WOULDING, a board a Ship, signifies the winding of Ropes fast about a Yard or Mast that is *fished* (as they call it) in order to make it hold the better.

WREATH, in Heraldry, signifies a Roll of fine Linnen or Silk (like that a Turkish Turbant) consisting of the Colours born in the Escutcheon, which in an Atchievment is placed between the Helmet and the Crest, and which doth immediately support the Crest.

WRECK, is where a Ship has perished on the Sea, and no Man escapes alive out of it. The Civilians term it *Naufragium*. This *Wreck* being made, the Goods that were in the Ship brought to Land by the Waves, belong to the King, or whom he assigns it to. But if a Man, or a Dog, or a Cat escape alive, and that the Party to whom the Goods belong, come within a Year and a Day, and prove the Goods to be his, he shall have them again, by the Provision of the Statute of *Westm. 1. cap. 4.*

WRIGHT'S *Sailing*. See *Mercator's Sailing*.

XEROPHTHALMY, a dry *Ophthalmy*, or Blood-shot of the Eyes, without Weeping, which happens usually in dry Weather. *Blanchard*.

XIPHIAS, according to some, is a sort of Comet, shaped like Swords; the Head being like the Hilt, and the Tail streight and pointed, yet some-

times bending like a Cymiser, but when it is of a lesser, and of a more contracted Form, 'tis like a Knife, or Dagger.

XYPHOIDES, is a pointed Cartilage of the Breast, called *Cartilago Ensisformis*,

XYSTER, is a Surgeons Instrument to shave and scrape Bones with.

YARDS of a Ship, are those long pieces of Timber which are made a little tapering at each End, and are fitted each to its proper Mast to carry the Sails which are fastned to these Yards at their Head, and are hoisted up and let down together with the Yards, by the Halliards.

For the Proportions of the Yards of a Ship, they commonly allow $\frac{1}{2}$ of the Length of her Keel, or $\frac{2}{3}$ of the Length of her Main-mast, for the Length of her Main-yards; and for the Thickness of them, they allow $\frac{1}{2}$ of an Inch for every Yard in Length; the Top-yard is $\frac{2}{3}$ of the Main-yard, and the Fore-yard is $\frac{1}{2}$ of the Main-yard, or as some say $\frac{8}{9}$: The Spritsail-yard and Cross-jack, are of the same Length, viz. $\frac{1}{2}$ the Main-yard; and the Thickness of the Mizen-yard and Spritsail-yard is $\frac{1}{2}$ Inch to a Yard in Length.

All small Yards are half the great Yards from Cleat to Cleat: When a great Yard is down a Port-luff, it gives the Length of all Topsail-sheets, Lifts and Ties, Jeers and Bunt-lines; as also of the Leech-lines and Halliards, measuring from the Hounds to the Deck: And when it is hoisted, it gives the Length of Clew-lines, Braces, Clew-garners, Tackles, Sheets and Bow-lines.

The Terms belonging to the Yards, are, 1. *Top the Yards*; that is, make them hang even. The Clew-lines do most properly Top the Main and Fore-yards; but when the Top-sails are stowed, then the Topsail-sheets will Top them. 2. *Brace the Yard*, i. e. Traverse aft the Yard-Arm, whose Brace is haled. So that *Traverse the Yard*, is the same as to say, *Brace it aft*. 3. *Square the Yards*, i. e. see that they hang right across the Ship, and one Yard-Arm not traversed more than the other.

YARE, is the Sea word for Nimble, Ready, Quick, or Expedition.

YAWES. At Sea, they say a Ship makes *Yawes*, when through the Fault of him at Helm she is not kept steady in her Course, but makes Angles in and out; to prevent which, the Conner cries, *Steady, Steady*, keep her Thus, Thus.

YEAR: The Time the Sun takes to go through the twelve Signs of the Zodiac. This is properly the Natural or Tropical Year, and contains 365 Days, 5 Hours, and 12 Minutes.

The *Sydereal Year*, is that Time in which the Sun departing from any fixed Star, comes to it again; and this is in 365 Days, 6 Hours, and almost 10 Minutes. But according to Sir Isaac Newton's New Theory of the Moon, the *Sydereal Year* is 365 D. 6 H. 9' 14''; and the *Tropical*, 365 D. 5 H. 48' 57''.

The *Civil Year*, which is commonly used by all Nations, is very various, both as to its Beginning, and also as to its Length, according as they follow the Course of the Sun, Moon, or both.

The *Civil Lunar Year* contains 12 Lunations or Synodical Months, and contains but 354 Days: This being 11 Days less than the Solar Year, its Head in about 33 Years will run through all the Months and Seasons of the Year. This kind of Year is now used by the *Turks*, and seems to have had its first Rise in Countries where the Difference

between Summer and Winter is not so sensible as it is with us; and where, for want of Astronomy, they know not how to estimate the Solar Year, and therefore began their Account of Months from the Phases of the Moon. And hence, as the learned Astronomer Dr. Gregory hints, it came to pass, that they began the Account of their Civil Day at Sun-set; for their Day must begin when their Month and Year did, and that was with the New Moon, which being to be determined by view, could not be discovered till after Sun-set.

The *Jews* had their *Secular Year*, which began at the Autumnal Equinox; and their *Sacred Year*, which began at the Vernal one.

The *Egyptians*, *Chaldeans* and *Assyrians*, first measured the Year by the Course of the Sun, which they supposed to contain but 360 Days; afterwards 5 more were added by *Mercury*, which he called *ἑρμηνεύς*, i. e. added; but yet no notice was taken of the 6 Hours; by which means the *Egyptian Year* hath fixed no place in reference to the true Solar Year; but anticipating a Day every four Years, runs quite round in 1460 Years.

This way of reckoning continued till *Egypt* becoming a Province of the *Roman Empire*, they took the *Julian Account*, only they kept the Names of their Months still, and order'd their matter so, that their *Thot*, the first Day of the Year, always happen'd on the 29th of *August* in the *Julian Year*. So that the *Egyptian* or *Coptick Year* is 4 Months and 3 Days before the *Roman Year*, which begins with the Calends of *January*.

The *Persians* account (according to the *Egyptian way*) 365 Days.

The *Arabs*, *Saracens* and *Turks*, count their Year by the Motion of the Moon, and make it consist of 12 Moons or Months, whereof some have 30, and some 29 Days alternately; and these altogether make but 354 Days; so that their Month *Mubarran*, in which they place the Beginning of the Year, is less than 34 Years will run quite round, and be in all Seasons. The *Arabs* indeed, by a Cycle of 30 Years, do remedy this by means of an *Intercalation* or *Embolism* of 11 Days:

The *Greeks* counted their Year by the Motion of both Sun and Moon, and finding that there was 11 Days difference between the Lunar and Solar Year; at first they added an Intercalary Month every two Years, containing 22 Days, which therefore they called *ἑμβολιασίων*, the added or inserted Month. Afterwards considering the 6 Hours also, they put their *Embolism* off till 4 Years end; and then making the 3 first Years to contain 354 Days a-piece, (which is the Lunar Year) this made the 4th Year to have 399 Days. And to make this *Intercalation* the more remarkable, they instituted the *Olympick Games* on every such 4th Year; whence came the Computation by *Olympiads*; each of which contain'd 4 Years.

Nevertheless they found that this would not do in process of Time; and therefore they first reduced the *Intercalation* to 8, and then to 11 Years; but still there was great Confusion, till one *Meto*, a Citizen and famous Astronomer of *Athens*, thought of joining the two last Periods 8 and 11 together;

together; which doing, he made a Period of 19 Years, in which the two Motions of the Sun and Moon are wholly accommodated, and the Moon changes on the same Day of the Month that she did 19 Years before. This Discovery, for its Fulness, was much celebrated, and the Number of the Period 19, the *Athenians* ordered to be set up in a publick Place, and to be written in Characters of Gold; whence it took the Name it still retains, being called the *Golden Number*.

The *Athenians* began their Year at the New Moon after the Summer Solstice; in their Month *Hecatombeon*, as *Plutarch* says.

There were also some Nations who made their Year to consist only of 4, or of but 3 Months, as *Macrobius* tells us in his *Saturnalia*, Lib. 1.

The *Carians* and *Acharnanians*, saith *Justin*, made their Year to consist of 6 Months, and reckoned but 15 Days to their Month.

The *Romans* had three sorts of Years: 1. That of *Romulus*, which contained but 10 Months; from whence the last Month of our Year retains the Name of *December*, as being the Tenth of his. This Year begun in *March*. 2. *Numa Pompilius* his Year; which had *Romulus* his gross Mistake corrected, and two more Months added to it, viz. *January* and *February*; and then it contained only 355 Days, or 12 Lunar Months. 3. The Year of *Julius Caesar*, who discovering that there were 10 Days more than *Numa* reckoned, made the Year 365 Days: And reserving the 6 Hours till every fourth Year, they then made another Day, which was added before the sixth of the Calends of *March*; so that in this fourth Year they accounted the 6th of the Calends of *March* twice; *Bis-sex-to-calendas*, whence came the Word *Bissextile* or Leap-year, as we call it; which hath 366 Days. This Account is now used in *England*, and is the *Julian* or *Old Style*.

But because there was still found an Error in this Calculation, and that the *Equinoxes* did plainly, tho' insensibly recede from the Points where *Caesar* had fixed them; as also, that the Year was discover'd to want about 11 Minutes of 365 Days and 6 Hours; which 11 Minutes will in 131 Years make the *Equinoxes* go back about a Day; *Pope Gregory XIII.* to reform (as he thought) this Error, ordered 10 Days to be taken from the Year, to bring the *Equinoxes* that Year (which was 1582) to *March 21*, and *Sept. 22*, '23. And this is what is called the *Gregorian Account* or *New Style*, as is used by the *Popish Nations* every where.

The *Great Year*, or the *Annus Magnus*, about 25000 or 26000 Years; in which Time the fixed Stars will appear to come to the same Point again, exactly after one entire Revolution.

YEAR and Day, in Law, is a Time that determines a Right in many Cases; and in some Works an Usucaption, in others a Prescription; as in Case of an Estray, if the Owner (Proclamations being made) challenge it not within that Time, it is Forfeited: So is the Year and Day given in case of Appeal, in case of Descent after Entry or Claim, and in case of a Man so bruised and wounded; of Protection, Effoigns in respect of the King's Service; of a Wreck, and divers other Cases. *Co. Vol. 6. Fol. 107.*

YEAR, Day and Waste, is a Part of the King's Prerogative, whereby he challengeth the Profits of their Lands and Tenements for a Year and a Day, that are attainted of Petty Treason, or Felony, whoever is Lord of the Mannor whereto the Lands or Tenements belong; and not only so, but in the End may waste the Tenements, destroy the Houses, root up the Woods, Gardens; Pasture, and plow up the Meadows, except the Lord of the Soil agree with him for Redemption of such Waste, afterwards restoring it to the Lord of the Fee.

YOKE: See *Sea-Yoke*.

ZENITH, or Vertex, is the Point in the Heavens, right over one's head, being necessarily 90 Degrees distant from the Horizon.

ZENITH Distance, is the Complement of the Sun, or Stars Meridian Altitude, or what the Meridian Altitude wants of 90 Degrees.

ZERNA: See *Lichen*.

ZETETICK Method in Mathematicks, is the Analytick, or Algebraick way, whereby the Nature and Reason of the thing is primarily investigated and discovered.

ZEUGMA, is a Figure in Grammar, when an Adjective or Verb, agreeing with a nearer Word, is also by way of Supplement referred to one more remote. Thus, *saith Terence, Utinam aut hic surdus, aut haec muta facta sit.*

ZOCCO: See *Plinius*.

ZOCLE, is a square Member in Architecture, being lower than its Breadth, which serves to support a Pillar, or any other part of a Building, instead of a Base, Plinth, or Pedestal.

Continued Zocle, is a kind of continued Pedestal, on which a Structure is raised, but hath no Base or Cornish.

ZODIACK, is a great Circle of the Sphere, dividing it into two equal Parts, cutting the Equator in the East and West Points of the Horizon. It cuts the Horizon and Equinoctial obliquely; making with the former an Angle equal to the Sun's greatest Meridian-Altitude in any Latitude; and with the Equinoctial, an Angle of 23° 30' Minutes, which is the Sun's greatest Declination.

This is a broad Circle, and through the middle of it is drawn a Line, called the Ecliptick, or *Via solis*, the Way of the Sun, because the Sun never deviates from it in his Annual Motion; as the Planets do all more or less, (whence it hath its Breadth.)

The *Zodiack*, in the Globe, is mark'd with the Characters of the Twelve Signs, and in it is found out the Sun's Place, which is *under what Star or Constellation he appears to be at Noon*.

By this are determined the four Quarters of the Year; and accordingly it is divided into 4 Parts, and as the Sun goes on here, he hath more or less Declination, North and South.

Also from this Circle, the Latitudes of the Planets and fixed Stars are accounted; from the Ecliptick towards its Poles.

And those Poles are 23 Degrees 30 Minutes distant from the Poles of the World, or of the Equinoctial; and by their Motions are the Polar Circles described.

In these Poles all the Circles of Longitude which are drawn through the *Zodiack*, do terminate, (as the Meridians and Hour Circles do in the Poles of the World) and as the Azimuth Circles do in the Zenith and Nadir.

The Breadth of this Circle, or rather Zone in the Heavens, is 20 Degrees, for beyond 10 Degrees North, or 10 Degrees South, the Latitude of no Planet ever reaches.

It seems to have been divided into 12 Parts, (which they call Signs) because while the Sun in a

Years time is running thro' the *Zodiack* or Ecliptick, there happen to be 12 Lunations: Or the Moon undergoes all her Changes and Phases, 12 times, pretty near. Each Sign is divided into 30 Degrees, so that the whole makes 360: And they begin to reckon at the Eastern Interfection of the Equinoctial and Ecliptick; or at the Vernal Equinox, where they place the first Point of *Aries*; going on thence to *Taurus*, *Gemini*, *Cancer*, &c. and when you count thus forward on according to the usual Order and Course of the Signs, they call it, *in consequentia*, but if you count backwards from *Taurus* to *Aries*, &c. they say, 'tis *in Antecedentia*.

The Reason of the Name of this Circle, and its Origin, was this.

The ancient Astronomers observed the Sun in his (apparent) annual Motion to describe always one and the same Line or Track in the Heavens, and never to deviate from this Path either to the North or the South, as all the other Planets, they found, did more or less. And because they observed the Sun to shift as it were backwards, thro' all the Parts of this Circle or Path, so that in his whole Years Course, he would Rise, Culminate, and Set with every Point of it, they distinguished the fixed Stars which appeared in or near this Circle into 12 Constellations or Divisions, which they called Signs, because they were Marks to distinguish whereabouts the Sun was. These Signs they painted usually in the Form of Animals, and thence came the word *Zodiack*; and the very middle Line of it is called the Ecliptick, because the Eclipses only happen when the Moon also is in that Line.

ZODIACK of the Comets; *Cassini* hath observed a certain Tract in the Heavens, within whose Bounds (by many Observations) he hath found most Comets, tho' not all, to keep. This he makes as broad as the other *Zodiack*, and marks it with Signs or Constellations like that, which are *Antinous*, *Pegasus*, *Andromeda*, *Taurus*, *Orion* the lesser Dog, *Hydra*, the Centaure, *Scorpion*, and *Sagittary*.

ZONE, in Geography, is a Space contained between two Parallels; of these Zones there are five commonly reckon'd, viz. two Frozen, two Temperate, and one Burning Zone.

The *Frozen Zones*, are those Parts of the Globe comprehended between the Pole and the Polar Circle; therefore one must be towards the North, the other towards the South: The *Frozen*, or *Frigid Zone*, towards the North, lying between the North Polar Circle, and the North Pole, contains part of *Iceland*, and *Norway*, *Lapland*, *Finmark*, *Samojeda*, *Nova-Zembla*, *Greenland*, and some other Parts of *North America*. The *Frigid Zone*, toward the South, lying between the South Polar Circle, and the South Pole, is not yet known whether it contains Land or Water.

The *Temperate Zones* are one on the North side of the Equator between the Arctick Circle, and the Tropic of *Cancer*; another on the South side between the Tropic of *Capricorn*, and the Antartick Circle.

Z Y G

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Torrid Zone, or *Burning Zone*, contains all that Space of Earth that lieth between the two Tropicks.

ZOOGRAPHY, is a Description of the Nature and Properties of Animal Bodies, such as Beasts, Birds, Fishes, Insects, &c.

ZOOTOMY, is an Artificial Dissection of Brute-Animals, as *Androtomy* is of the Bodies of Men.

ZUGOMATICUS, is a Muscle of the Face, so called by *Riolan*, because it arises from the *Os Fugale*, or *Zugoma*. Its Origination is round and fleshy from the external Part of the said Bone; whence descending obliquely forwards, is inserted near the Angle of the Lips. Whence the Muscle and its Partner act, they draw both Lips upwards, and make a pleasant Countenance.

ZYGOMA, or *Os Mali*, is one of the Bones of

the Upper Jaw, it is of a triangular Figure; on the upper part it joins to the *Os Sphenoides*, on the lower to the *Os Maxillare*; its external part hath a long Process, called *Processus Zygomaticus*; it joins with the *Os Frontis*, at the Corner of the Eye.

ZYGOMATICUM, are Muscles which draw both Lips obliquely to either side, and are otherwise called *Fugale*.

ZYMOMA, is any Ferment, as the Nitrous Air, the Watry Juice in the Mouth, the Acid Liquor in the Stomach, the Blood in the Spleen, &c. *Blanchard*.

ZYMOSIMETRE, is an Instrument whereby the Degree of the Fermentation arising from the mixture of divers Liquors, is measured; or the Temperament or Degree of Heat in the Blood of Animals, &c.

ZYMOSIS: See *Fermentation*.

F I N I S.

